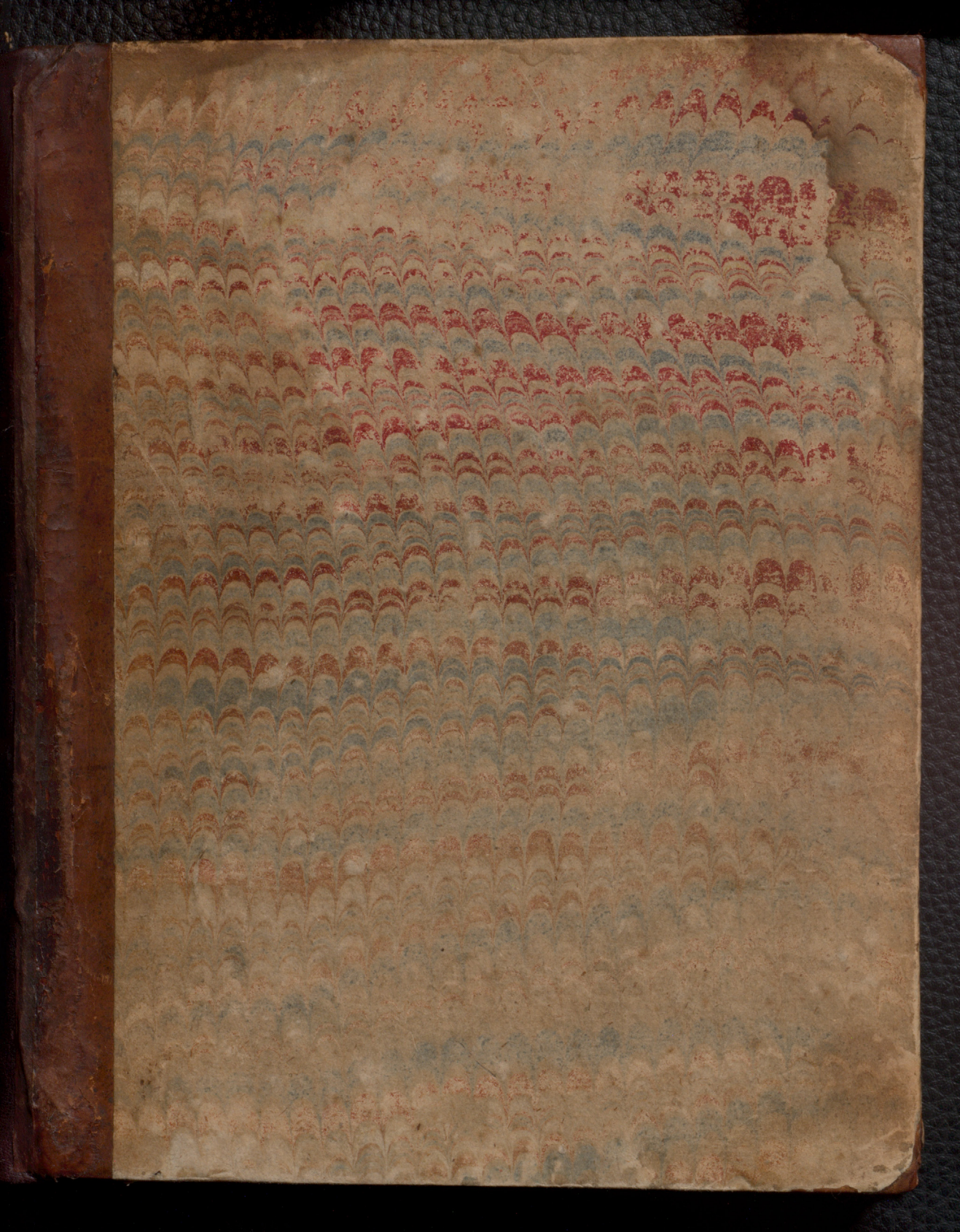
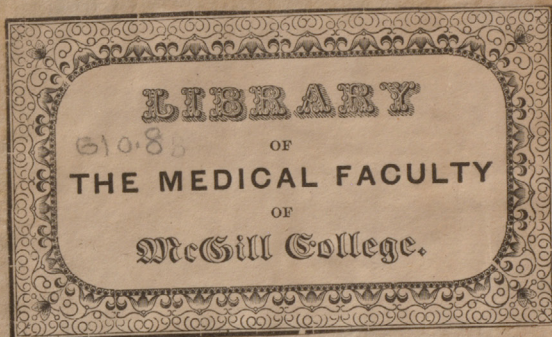






21.2,

THE
OSLER LIBRARY
MCGILL UNIVERSITY
MONTREAL
Acc. 12570

MS.

Acc no. 346

v. 4

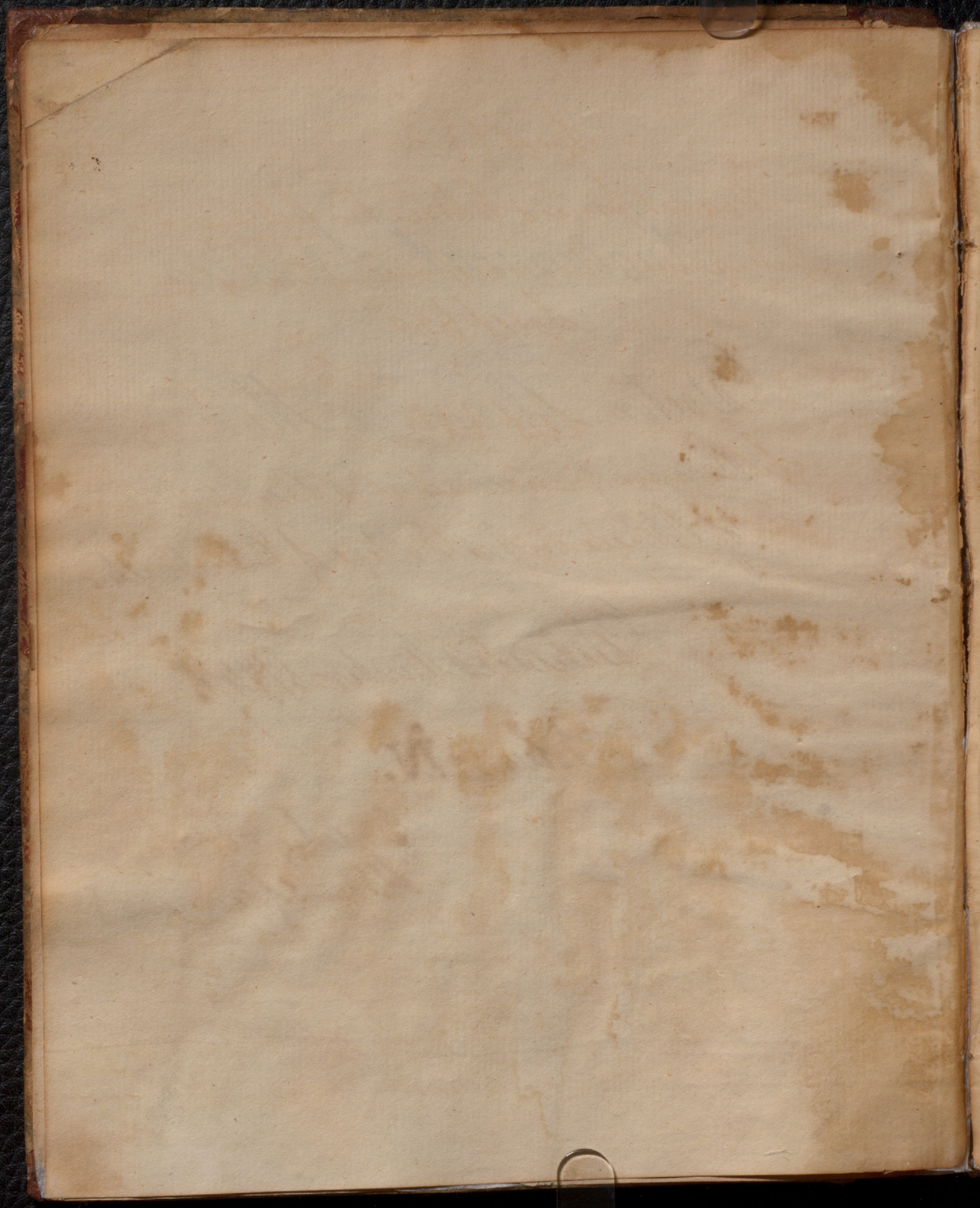
Anatomical Lectures

By
Doctor Alexander Monro
Professor of Anatomy and the Practice
of Physic in the College of Edinburgh.

Delivered Winter 1774/5.

Volume IV.

Wrote by Robert Syme
M.D. of Medicine }



Lect 62 D

869.

We next proceed to trace the Subclavian
Artery with the corresponding Veins. —

Lect 63 D

and Nerves

Lect 64th

Let us now consider what application We can
make to Physiology or Practice of the two last
Demonstrations, beginning with the
Blood vessels. You have seen that from
the Arch of the Aorta three branches come off,
The Right one supplying the subclavian
and Carotid of that side, the other two being
The Left Carotid and Subclavian. You'll
observe another fact, That the first branch is
more opposite to the mouth of the Heart is
more in a direct line with the ascending
Aorta.

804 Branch than the other two. From this
situation then a greater quantity of blood
will get into the first branch, and it will
meet with less resistance; the sides of 4 single
Branch making less resistance than the
coats of the other two vessels. Hence on the
supposition that the Subclavian Arteries
are originally of the same size a greater
quantity of blood is determined into the Right
arm. Now may we not connect with this
circumstance the preference w^h Man kind
universally give to one arm. In all
nations the one arm is used more generally
used than the other; may we consider
the Distribution and this as Cause and
Effect. This notion as far as I know was
first

first proposed by Mr. Walker, and the ^{805.}
more I consider the more I am convinced of
the propriety of it. For on comparing the
Nerves in the most accurate manner I can
observe no kind of difference. Now tho we
see an evident final cause, that by using
one arm frequently, we acquire a greater
dexterity in performing any necessary office,
yet to the final we should be able to add
the efficient cause, and I use no other but
the one just now mentioned. May further,
looking into the Animal Kingdom, as in
the Quadruped we must use the one fore
extremity along with the other often
than we do, we find a similar structure
and a preference given, so that it is a very
difficult matter to force a Horse to walk
with

800. with his left shoulder foremost, as the
Naturally prefers the Right. And in Birds
where of greater strength in one wing would
have been hurtful, as both extremities must
strike the air with equal force, the Aorta
sends off two equal branches each subdividing
into axillaries and subclavians. To show the
Necessity of an equal strength, If we cut off one
wing of a fly, it falls to the ground, but if we
cut off equal portions from both it is able to
support itself. Now, tho the strength of the
motion depends upon the Nerves, yet the
accompanying blood vessels actuate, & move
in motion as well as in sense. So we have
seen a greater number of Arteries dispersed on
the Nerves than we can account for on
any

any other supposition. In the same manner ^{84.}
by stopping the Circulation of the blood in a
Muscle we weaken its force, and in the Muscles
most frequently employed, We always find the
deepest colour. Thus in Birds & Mammals, the flesh
of the Wing is of a deeper colour than the rest, while
in the Quadruped the colour of the Leg is deepest.
So the preference seems to depend upon this cir-
-cumstance, That sensible of greater power, We are
led to employ the Right arm more frequently
than the Left, and Nature adds to what the
original structure introduces, so that if the
Right arm is disabled this power by Habit
comes unto the Left. Perhaps if attention were
paid to the Duration of the Repels in People
who are left handed, probably this might
be proved more readily where there is a
Laxer Nature, as where there are ^{short} Branches

308. Branches send off instead of Three.

Now, Pursuing the dissection we find that it runs off the Vertebral, but Nature does not trust the Supply of the Brain to one or Two Vessels, but to a number, and you know the small branches of these are again made to communicate within the Head. Now, we find the artery passing behind the Anterior Scalenes, borrowing protection from it, and it is in no danger of being squeezed by the Muscle when in action, as the Muscle rather starts out from it at that time.

After this the Subclavian passes behind the Clavicle, or between it, and the 1st rib, so that it now properly deserves the name Subclavian.

At this place we can feel the stroke of it, as, excepting the Thor. Pectoral & Myodes, there is nothing but the Thor. Cells above it, so, and passes superficially, & has a flat bone the

809.
As it is, we can stop the flow of
blood thro' it by a slight compression, then as
preparing the Thumb downwards at the back of
the middle of the clavicle the Pulse ceases.
Now this circumstance is of the utmost import-
-ance in doing many operations which are
otherwise very hazardous. Even the case of an
aneurism forming near the top of the Thrombus,
or in the case of an Amputation of an extremity
at or near the Joint. Mr. Sharp and others
used to make the incision of the Artery, and then
endeavour to catch hold of it, not being aware
at all of the possibility of compressing it, or
suppose any accidental wound to have
happened, or that we are entering Tumours
as in the case of the Excision of the Mamma,
the Arterial Thoracic artery supplies each
part

810. part of the Tumour, and it is seldom difficult
to stop them, but if it should, the pressure there
will stop the bleeding effectually. Many years
after I had made this operation, a Gentleman
showed me a Tourniquet he had got from
another for the purpose of making pressure there,
by means of straps fast round the body. But
the motion of the clavicle in moving & acrom
during the operation renders the application
of this in a great measure impracticable,
and applying a flannel, as the pressure of the
Thumb will do it sufficiently.

The Artery next getting into the Axilla, gives
off a number of branches, which are generally
small, and it is protected by the two muscles
of the Tumour that come from the Neck.
The Pedoral & Subscapular Dorsal. so as
using

using still the arm does not waste so much
 as otherwise it would have done, the Milt
 bearing against their edge, but scarcely against
 the blood vessels between. Then the artery
 has connected to it the axillary gland as the
 lower side, which when in the sound body
 are found by cells so pretty closely, and when
 they are diseased as in the Cancer of Mamma
 the adhesion is more intimate. And therefore
 where there is a necessity of extirpating these
 glands we are to proceed with y^e utmost caution;
 so I have seen the surgeon obliged to lay aside
 the Knife, and to make the separation with
 his fingers; the axillary gland pressing close
 on the coat of the artery makes a little turn
 over the head of the Thoracic to get to the
 body of it; If therefore a dissection happens
 in wh^{ch} the bone is placed somewhat lower
 than

812. More common, that it does not slide directly
forwards, but inward and downwards, the
head of it comes to stretch the artery very much,
whereby the Pulse becomes weaker, while the
Nerves being stretched at the same time, Pain
and Mumbling are occasioned.

Further down than this, we find the Artery
coming out & running parallel with the
So Veneri, at the inner side of the Biceps muscle,
and covered by an Aponeurosis which comes
off from the Muscles, and which is not enough
attended to. Authors only regard that which
is furnished by the Biceps, but the whole way
down the artery is concealed by a thin mem-
brane, as it is only so thinly covered, and runs
near to the bone, so easy to feel the stroke
of the Artery the whole way, and for the
same

same reason it is easy to compress it, and 813.
hence surgeons in performing amputation
lower than the acilla, apply the Tourniquette
to this line, for the whole length of the
Wrist we can equally well stop the blood.
This situation is the best for safety as there is
no part of the Arm so little exposed to injury.
The artery seems nearly parallel to the scars
Leybros make in ones sleeve, and the Wrist
is a sufficient mark for knowing the manner
of applying the Tourniquette. In this course
branches are constantly passing off, but few
of them are large. At the top of the Arm you
have seen Arteries passing over the Scapula,
others on the Coracopect, and branches are
found to commence at the bottom of the
Scapula; lower than that the Muscular
Spiral

814. Axillary Artery is sent off, passing round the
Arm, and the Branches are continued as low
as the Elbow. The Artery in its descent passes
behind the Aponeurosis of the Pectoris, which is
a covering & defence to it, while at the same
time it covers & gives origin to the Muscles;
So that I cannot cut away the Aponeurosis
without making the surface of them rough.

When the arm was bent I then found that
the bottom of the Girth was an inch or more
lower than the Articulation, then it sends
off the Radial, and Ulnar branches, and
from both of these we find recurrent arteries
running up in the hollows made by the
Processes of the Bones, & communicating
with the Arteries placed higher. From
the Ulnar Branch next come Median
or

815

or Interglossous Arteries, and from thence
too there are recurrents. And tracing the
Radial and Ulnar branches to the hand
we find large arches formed, a superficial
one under the Aponeurosis, and a Deep one
under the tendons, so that pressure does not
stop circulation in all the parts, and though
one of these principle branches be cut thro',
still every part of the Member may be sup=
plied with a large quantity of blood, tho' the
Radial be cut the blood passes down the
Ulnar to the hand, & again ascends thro'
the Radial, so that there will be a necessity
of tying the Artery both above & below, or the
blood would run from it with considerable
violence. We see then the use of these Anas=
tosis, and the necessity of their being
made

816. more frequent about the hand, from the
varied direction of the Muscles, and 4th part
being exposed to a greater pressure, and we
may see that Wounds are not dangerous
merely from the stopping of the blood.

Now next let us consider the danger that
may attend Wounds higher, and determine
the place wounded in the most common
operation of Bloodletting. — If we were
merely to reason we would conclude that
the Branches which come off about 4th elbow
from the Humeral artery are so small, that
in the case of a wound made in the Trunk
of this Artery, a Gangrene would be brought
up on the Member; and several try to
persuade us, even the best Writers on the
subject, that not the Brachial, but the
Radial

817.
Radial branch is wounded in drawing
blood, whereas it is certain that the Thumb itself
is the common subject of the wound, & that
for reasons, several of which you already
know. First, The Thumb is not only much
larger than either of the Branches, but the
skin over it, is upon the whole thinner, just
as the skin in every part of the body is thinner
where a flexion is made. Next, from the
swelling of the ends of the Ar. Pomeri, the
artery is laid forward, and we can see &
motion of the Thumb of the Humeral Artery,
but we cannot see, nor well feel, motion
of the Radial Branch. And the Thumb
runs an inch under the joint before it
makes the division, and blood is commonly
let higher than this. Walland & Wichest has

8185 has happened, That in taking up this Artery
a large nerve has been included, which is
a proof that the Nerve was taken up, and
those which are of a different opinion have
been misled by supposing that the Radial
Nerve accompanies the Radial Branch.
But I have found out that there is some
impropriety in this description, and observed
that the Radial Nerve accompanies the
Deep one the Ulnar, so where the Nerve was
taken in, either the Thumb or the Ulnar
Branch must have been wounded, and
the last is very deep. Besides I have seen
4 Cases of Aneurism, and in every one of
them I saw the wound in the Thumb.
And Hodgkine who dissected two aneurisms
after death, found the wound swelling,
i.e.

is 12 parts of an inch higher than the ^{819.}
Division into Branches. So there is no doubt
But that the Trunk is often wounded, and
That cures are often made by tying it. So
we are led from this fact, to make the
application to other cases, and particularly
I may alledge That there is a probability
That we should be able to save y^e Arm

by making ligatures on the
is near to their very beginning; for
Squeezed in by the lateral comon
freely to the lower part; but y^e chance
is not so good, as a greater size of number
the nourished by some small vessels.
in case which you'll find in the
of Surgery books, the sides of
the humeral artery were grown together
by

8185 has happened, That in taking up this Artery
a large nerve has been included, which is
a proof that the Artery was taken up, and
those which are of a different opinion have
been misled by supposing that the Radial
Nerve accompanies the Radial Branch.
But I have found out that there is some
impropriety in this description, and I find
that the Radial Nerve accompanies the
Deep one the Ulnar, so when the Artery
is taken in, either the Radial or the Ulnar
Branch must have been wounded
the last is very Deep. Besides I have
seen Cases of Aneurism, and in every
then I saw the wound in the Arm
and Hoburne who dissected two
after death, found the wound in

ie 12 parts of an inch higher than the ^{819.}
Division into Branches. So there is no doubt
But that the Trunk is often wounded, and
That cures are often made by tying it. So
we are led from this fact, to make the
application to other cases, and particularly
I may alledge That there is a probability
That we should be able to save y^e Arm
or the Leg by making ligatures on the
Arteries near to their very beginning; for
Water Squinted in by the lateral common
Passes freely to the lower part; but y^e Chance
is somewhat less, as a greater size of number
must be nourished by sm^l vessels.
In one case which you'll find in the
Physical & Surgery pages, the sides of
the Humeral Artery were grown together
by

820. by the compression of an aneurismal sac,
the Branches dilating, as the Tumour gradually
formed, and in Whites surgical cases, We
inform us, That We dissected an Arm, two
years after the operation for the Aneurism
had been performed, and found a great
increase of the communicating branches,
That they were as large as crow quills
upon the side of the Member. —

Now after making this conclusion from
Observing the common structure, Let us have
in view the diverse Nature, for We may derive
Real Knowledge from knowing them. There
are two of them, and I would suppose that
they happen in one of 20 or 30 Parts. — The
most common is the Division of the Humeral
Artery above the middle of the Humerus
into

into two branches. So the Surgeon ought ^{824.}
always to proceed upon the supposition that
such a division may take place in performing
the operation for the Aneurism, and We will succeed
without more risque than where a common divi-
-sion takes place, and We will find no difficulty
of separating the one branch from the other, they
being connected in the loosest manner, only We
must remember to lyge the Artery in two places.

Another Arterial Nature ought to be attended to,
That sometimes a branch wanders over the Epi-
-neurosis between the Artery and the Skin, w^{ch} may
be opened with a Lancet, so we should not
attempt to open any vein till we have
felt the course of it, or. & that there is no Artery
connected with it.

Next, let us attend to the Veins, & the connection
between these and the Arteries, more especially
at

822. at the Elbow. You have seen two sets of
Veins, The first closely accompanying Arteries;
but more numerous than these there are
several venae comites, and these find their surround
the Arteries, so that the name of Satellites has
been employed by Winslow and others not
improperly. These venae satellites have
numerous communications, two veins run
a little way, then there is a cross branch, then
two veins going to one trunk. This runs a
little further, then it divides again, and the
veins attending the Arteries are more numerous
than they are.

Next, there is a subcutaneous set of veins
which convey more blood than the comites
when taken together, because from the
number of Muscles more especially about
the hand and Fore arm, there is a remarkable
danger

Danger of the interruption of the blood in
the Venae comites, & hence a sett turns as free
 from the action of the Muscles as possible, and
 both are crowded with valves, as are also
 the Veins of the Head Neck; and therefore we
 have the clearest proof that they are not
 extended to open the column of blood, for they
 are equally numerous above, as below the
 Heart; if the Veins are exposed to pressure
 so they only determine the blood to the Heart.
 Next, the Venae comites, & subcutaneous ones
 have numerous communications, so by
 acting with the Muscles we determine
 a greater quantity of blood into the subcutaneous
 Veins, and therefore surgeons when letting
 blood desire the Patient to move his fingers.
 By the action of the Muscles the blood is made
 to

824 To Circulate with more rapidly, but it is chiefly determined from the deep being into the Subcutaneous. When the Patient is performing this action, if the Darts irregularly Surgeons have opened the Blood to run per saltum from the Veins, imitating the wound of an Artery, but the Patient ceasing from motion we can tell more readily whether the Blood comes from the Artery or from the other. Next, We have seen that the Subcutaneous Veins, as we go upwards, where the Muscles run more parallel, join with the Deep Veins. There is one exception in the Cephalic, it runs along the outside of the arm at a distance from the rest, perhaps to guard against all accidents, That is a Tumor for instance forms on the inner side of the arm, & blood may be returned to the heart easily.

Near to the Elbow we draw blood from the
 Vein, we prefer this place because the Vein
 is thinner, & the Veins larger, in some cases
 we open these near the hand, but that
 not without great danger, as will appear
 when the effect upon the Veins is better
 understood. If we were to Judge from the
 size of the Veins, and their connection with
 the Arteries, we would say that it is safer to
 open the Cephalic, the Median Cephalic or
 the proper Basilic branch, than the Median
Basilic, behind which the Artery passes, but
 upon the whole the Median Basilic is the
 largest Vein, and being situated more nearly
 to the place of the Pleasing, the Vein is
 thinner than in any other part, so from
 the view of the vessels we would prefer
 opening the Median Basilic, and we can
 show

826. Show the artery behind it, holding it either
lower or higher than the artery; Or if we are
under a necessity of opening it across the artery,
we would do the operation with a sharp
Sawcut, that the skin may not pull in before
it, and bring the instrument too near the
artery. Now, suppose that in attempting
to open the Median Basilic, the artery is
wounded, let us see what different appearances
may be produced.

First, We can imagine that the External coats
of the artery only are cut, and I have heard
of one case, where the edge of a sword had
this effect, no blood was immediately discharged
but at length a true aneurism of internal
coats formed; But when the Sancer enters
thru all the coats, and if the opening is very
large

824.

large & directly opposite to the opening of
the skin, the blood is known for saltern
and we increase its force by making the
pressure under the orifice, so there is no difficulty
in knowing when it comes from an artery.

But frequently the opening is indirect, partly
after the ligature is loosened & hence the blood
is diffused, if the wound be large in the
aponeurosis, & on the coat of the artery and
the hole of the skin does not correspond, the
blood spreads itself in the cellular, as water
does in the anasarca, or there is a diffused
aneurism, of which I have seen two or three
cases, where the blood spread down the
whole forearm & increased it in bulk.

But if the wound be small, while perhaps
the aponeurosis of the Biceps Muscle has
not

828. not been wounded opposite to the Artery,
or by the situation of the Member being changed
the Aponeurosis is applied over it, the small
quantity of blood which gells out does not
spread, but collects in the condensed fibres,
and a circumscribed tumour is formed, which
will take six months perhaps before it
comes to the size of an Egg and resembles
much a true Aneurism i.e. There is a
tumour of an equal shape, and the blood
very often whilst it is small, remains fluid,
so that by pressure you can diminish the
size & squeeze the blood back into the Artery.
But when the Tumour is large & has contained
long the blood clotted within it, forms a cake
within the sac, so that we cannot press
back the blood. Now this last is the most
com-

common appearance, there is a circumscribed 829.
tumor formed which is caused by an abscess of
the Pectoral Muscle. There is another accident
which we would suppose must frequently
happen, but of which we would suppose to
have seen but few instances. As the Artery
is frequently wounded thro' the Vein, it is seldom
the Surgeon goes so far wrong as not to strike
the Vein, but passes the lance thro' both, thro'
the Vein, the Abscess, and then into the
coat of the Artery; Now, why does not the blood
rush from the Artery into the Vein? But we
explain it from the yielding of the Cells so
whenever the blood spreads, and the sides of
the Vein shut together. But in some instances
the communication opened has been preserved,
and the disease is named an Aneurismal
Narise

830. Varix, or the veins soon become Varicose
and this affords a proof of the great force of the
Heart in the Circulation, the coats of the Vein
yielding to the force of the blood within the
artery. In the Grogs of London we have
Three distinct instances of this; One case of it occurred
in our Infirmary, and I met with another
last Summer with Mr Wood; Now in one
of the cases mentioned in the Grogs, there was
a canal of communication between the Artery
and Median Basilic vein, and this is supposed
to have been by the fell. so, but there is a
circumstance to be taken into Acct. which
makes the appearance very different in se
ans i.e. Besides the vein is indurated, and the
Wound in the Artery, the vena comes The
the Phrenic vein itself is cut, and the
com-

communication is directly between it and 331.

the Artery, then there is an appearance of canals
from the Artery to the Ethereal Veins; and I have
no doubt that this communⁿ is between the Humoral
Veins and the Artery, and in a secondary
way between the Humoral Veins and the
Median Basilic. Now supposing that could
not take place are we to follow the opinion
in these Groups of not attempting any operⁿ?
because say they, the blood getting into y^e Veins
finds a ready road to the Heart, so the Vessels
are not in danger of increasing much, and
the Patient may live many years without
the danger of their bursting; but I wd take
the contrary opinion, and say, That in the
Aneurismal Varix the operation is more
necessary than in the other species. For first

892. First the Patient in the Infirmary, tho the
Tumor was small, not bigger than the Joint of
ones Thumb, Had not only a vast Degree of
weakness in the Member, but felt an insupportable
uneasiness and pain in it, and yet no
Nerves were punctured. In the other case
the Tumor had increased to the size of an Egg,
and all the Veins going into it and coming
out from it were enormously enlarged, and
during the time he staid in town it was
evidently on the increase - Now by Delaying
the operation, if we at length must perform
it, we have two diseases to contend with viz
a Varicous Distension of the Veins, accompanied
with Weakness of the Artery. And there is
another circumstance which would not
have been foreseen, That it is an operation
of

of more dangerous consequences than the
common one when doubled. In the case I
mentioned last evening, things were done, and yet
it was the most disagreeable operation I ever
was at, for every vein pours out blood proportioned
to its size, and every artery a ligature, as
much as the principal trunk of the Artery.

The common was not that the Humor Vein
but the artery opened on one side of the tumour
and the vein on the other, and both openings
were bound and closed. The Artery as well
as the vein was greatly enlarged, the Diameter
double, the capacity therefore 14 times. One
Gentleman who has wrote about it increase
of the Artery explains it from the blood getting
out of the Artery into the Cells, and pressing
on the side of the Artery lower than the
orifice

834. orifice, whereby the force of the Heart is more
spent on the upper part of the Artery; but may
be, if the Disease has been long left to increase
is much enlarged, and in proportion to this
pour out a vast quantity of blood. So as soon
as the Disease is discovered We ought immediately
to proceed to the operation. We may endeavour
to prevent the increase by gentle compression,
on the Artery; and to increase the Flow thro'
the Neighbouring branches previous to the
operation, but We must not spend too much
time on this, as the common Branches
increase when the Artery is tied; the same
thing happens in the course of the Disease
whenever increases the size of the Trunk
about the orifice must have the same
effect upon the Branches. We will see
why

835.

Why in one person there will be no pulse,
when it is felt immediately after the Ligature, and
yet in a few minutes, or in the space of an hour,
it will be distinctly felt. in another case again
the Pulse is not to be felt till the 2^d or 3^d day
after the operation. In this Patient the Pulse
was most distinct next morning. For where
the Anastomosis are considerable we do not
instantly feel the Stroke because they are
empty of blood, but after these are tied and
all the Satural Branches detached then the
Stroke is communicated, in other cases it
requires several days to give the necessary
dilatation. So we may explain what
happens in diff^t cases from the previous
time that has passed between the accident
and the operation, the size of the Tumor, and

836. and the fact it may be supposed to have
on the artery. —

Lect. 65th

Having now consid^d the distribution of
the Arteries & Veins, let us turn our attention
to the Nerves of the Neck & Arm.

All of them are emitted & derived from the
Spinal Marrow, which substance you know to
be the continuation of the Medulla of y^e Brain
& cerebellum with a slight addition of Cortex.
Next, you have seen that each of the Spinal
Nerves is composed of two Bundles of Threads
an Anterior & Posterior. Next, that the Threads
of the Posterior Bundle are enlarged & joined
together so as to form a so called Ganglion, the
colour & consistence of which appears very
diff^t from the Threads that enter it, or we
cannot by Dissection trace these thro^{ugh} the
Gangl^{ion}

ganglion. We are far from being certain ^{897.}
of the Nature of Ganglions, and at present I
avoid making any conjectures concerning
them. I would only observe that there seems
to be here a very minute Distribution of
Nerves into Threads, but there may be some-
what more than this; Next, we observe the
Ganglion produced till the Anterior Bundle
is added, and still we find the two Bundles
conducted further in the same sheath of the
Dura Mater, and beyond all doubt the
Threads of these are again intimately mixed,
that they do not lie in an Anterior & Posterior
bundle as within the sheath of the bones, but
the sev^l Threads cross each other; then we find
the Ligament sacro thro between the Vertebrae, in
a hole common to the two, immediately after
that, the sev^l nerves are brought to comm^{te}
or

Ganglion. Mean far from being certain 89%
of the Nature of Ganglions, and at present I

Munro, Alexander, (primus) 1697-1767.

At the age of twenty-two became professor of anatomy at the University of Edinburgh: a teacher of marked ability, whose courses were followed by enthusiastic students in large numbers. It is interesting to remember that three generations of Munros, all named Alexander, held the Chair of anatomy at Edinburgh for a period of 126 years. Largely due to the influence of the first two Munros that Edinburgh became the great centre of medical teaching.

Garrison: History of Medicine.
p. 260.

That they do not lie in an Anterior & Posterior
bundle as within the sheath of the bones, but
the two threads cross each other, then we find
the chord sent thro between the vertebrae, in
a hole common to the two, immediately after
that, the two nerves are brought to communicate
or

838. or to be connected to each other.

First, We may remark the Deep Cervical Nerve sent upwards from the neck in a very particular manner within the cranium, then again out of it, and getting out a second time connected with other Cervicals - Next, The great Sympathetic or Intercostal Nerve receives various additions from the Cervical Nerves, each of them furnishing Threads. In like manner one called Phrenic takes its rise, and, after this connection by great Nerves, We find among all a more particular and close connection by the arches which I demonstrated, but in which there are no Ganglia, nor any enlargement, which We cannot account for. The Threads in the Arches have not yet been prosecuted with any degree of accuracy, only from each Cervical nerve a bundle is sent off, which is

is tied to a similar bundle of neighbouring
 Nerve, and again new threads come from
 these; so we can trace these the whole way
 down the Neck, and you will find them con-
 =tinued in the Trunk of the body; we cannot
 altogether see therefore, but a few Cervical
 Nerve may send threads for under our
 Trunk, even towards the lower extremities.
 We cannot say how far each of the threads are
 propagated, so we are not able to determine
 the part of Nerves from which each muscle
 of the body is supplied. At the lower part of the
 Neck we observe the Nerves considerably longer
 than higher up, and we find four of them
 with the First Dorsal sent to the arm, and
 these again are connected to the Nerves above
 and below, so that certain portions of the
 Nerves

840. letters and under names may be supposed
to have the same terminations.

Following these names wth supply the arm, we
find that their connections are in a manner
several times repeated, the outline of which has
been tolerably well represented by Eustachius,
but the real nature, and the use is by no
means sufficiently attended to. I have had
occasion to point ^{it} out in a gen^l way, but
as the proof is more evident from the arm
I shall recapitulate a little what I before
mentioned. We find for instance the 4th
cervical joint to the 5th, a common chord
form^d; and lower than this that the 6th is
added to this common chord. Lower still
perhaps the 7th and the 1st Dorsal, and arches
one and again repeated in the progress of
the

The Nerves to the Viscera, or Pleurae are formed.

Now upon splitting the sheaths at every conjunction
of the Nerves there is a real Decussation and
Intermixture of fibres; We are not to conceive
that Nature brings them together in a common
sheath merely to occupy less room, then that
each comes off in distinct parts; on the contrary
every Nerve which enters into it, & where
we find a chord sent to any muscle, we may
take it for granted that that Muscle is supplied
from every one of the Nerves, which come
higher than the place of its origin. Thus the
Muscular Spinal nerve comes from the
lowest part of the Plexus, now I know
from Dissection that this is composed of
every one of the others - Now see then what
follows from this, the Plexus supply the
in distinct branches the several muscles placed
lower

842. Now, Nerves & Arteries derive their Nerves
from the very same origin, that this occasions
no difficulty in our employing them, that it
is not necessary that Antagonist Muscles shd
come from different roots. For instance We
observe that the superior oblique of the Eye
receives a nerve in a very curious way,
and Anatomists & Physiologists conclude that
it shd not receive it from the same root with
the Inferior Oblique does, as they are in certain
cases Antagonists; Now, tho it is difficult to
say why this Nerve comes a certain way
We are by no means to draw a general
conclusion; for We find that every Muscle
receives Nerves from a number of roots, and
the Antagonist muscle receives Nerves from
the same roots. It is absurd to say that
our

our motions are more uniform because
 of these connections. The meaning of the union
 is very different, it is to connect as many Nerves
 as possible, and to supply every part from a
 number of sources, and however difficult it
 may seem to us, that so many diff^t threads
 are put into play at the same time, yet all
 the long Muscles of the body receive their Nerves
 in very different directions.

Now, having traced the Nerves thro' the
 Pleura, we find that a pretty leg^r division
 is made of them to the different parts of the
 body, such as can be included in a general
 Description, and from which there are very
 few known Nerves, especially of the deeper
 Nerves, comparing it with the Blood vessels
 there is a remarkable agreement. The
 Deep

344. Deep nerves very closely accompany the Arteries, and the superficial the Cutaneous Veins, so that the Demonstration of the Nerves is a repetition of the Demonstration of the Arteries. The Posterior Scapular is accompanied by its Artery every where, then the Articular Circumflexa Nerve with its Artery lower down, the Musculo-Spiral Nerve following nearly in the same Direction. The Ulnar Nerve accompanies the Ulnar Artery. The Radial or Median nerve of Winters accompanies first, The Tendon of the Humeral Muscles parallel to the Radial branch, but at some little Distance from it, whilst the two remaining Nerves, The Musculo-cutaneous Nerves accompany the Cephalic & Basilic Veins.

Our being intimately acquainted with the Situation is of great use, We are thereby able

able to explain appearances, as Want of 345.
motion, or a Convulsion, or a Spasm of particular
muscles, from various causes; we are directed
from increasing the course in the application
of Remedies, as in Applying external irritation,
in communicating Electrical shocks, & chiefly
the Knowledge is of the utmost importance in
in Surgery. That in doing many operations
We avoid Wounding the Nerves, or in Amputation
the Division is necessary, in stopping the blood,
and taking up the Blood vessels we would
separate them from the Nerves; or there is a
great Room for improving on the common
method of sewing the extremities of the Vessels
with needles so as to lessen the injury. But
by cutting the Nerve, you have not done
it all the injury it is capable of receiving,
but the tying on, may occasion suff. evil.
and

846. and wrought in direful incisions, & alluded
to the course of the smallest of the Nerves, because
Wounds of them may be attended with the
utmost degree of Danger. So if We are to make
an incision on the finger, both to the sides
that are gently laid down, they are the worst
that could be imagined - Of a Patient labours
in a Paronychia, Surgeons apprehensive of
wounding the tendons at the middle, first
to make the opening at the side, where there
is the principle Nerve: whereas We would
especially avoid the Nerves there, as they
are very much on the stretch, & it is difficult
to relax them.

Still smaller Nerves produce the most
dangerous & fatal Symptoms in Blood Letting,
and as it is material to determine this
point

point, I shall explain it at some length, ^{814.}
and enter into all the arguments that throw
any light on the matter. It has been known
for many ages, from the days of Hippocrates
Galen & onwards, that symptoms of
danger sometimes fatal, are occasioned by
bloodletting about the Elbow, and this I believe
is universally admitted; the only thing in
which there is a difficulty is with respect
to the place wounded. Now first let us
know the real symptoms and appearances
produced by such a wound. I have had
occasion to see a number, & they proceed
in this manner; In some cases the Patient
as soon as the puncture is made, altho
very instant feels a very acute pain, some
Persons have shrieked violently, fallen
into

848 into a Tremor, and fainted immediately on
receiving the Stroke; but giving the Patient feels
only a somewhat greater Degree of Pain
than common, such as is tolerable, that He
can keep from crying aloud; He conceives
that the surgical lancet has been broke
and that the point is sticking in his arm,
or He imagines that there is at least some
rust remaining in the part. Soon after a
swelling begins, which in 24 hours is considerable,
It spreads from the part wounded downwards,
as well as upwards; In such cases we should
fear the extent was not greater than could
be covered by the breadth of ones hand, i.e. It
extended about two inches both upwards &
downwards, occupying the whole breadth
of the arm; The Skin comes to be affected,
feels

feels hard & is discoloured, and where the
 swelling is considerable it gets that extremely
 dark colour which occurs in a bad kind
 of Erysipelas. With the swelling there must
 be an increase of stiffness in the part, and
 a degree of pain but not very acute, a kind
 of swelling pain which shoots up to the
 top of the humerus, & scarcely goes higher.
 The wound of the vein & skin in the mean
 time remains open, and I have seen it
 continue without closing for 10 or 12 days;
 or if it seems to close, the union of the sides
 is made by a very thin film, totally different
 from the fibrine where no uncommon accident
 has happened, and if you break that film,
 or if it has never formed, in doing it you give
 the Patient no pain, & there is discharged a
 small

850. Small quantity of a brownish colour, or
sometimes clear watery looking matter, seldom
of the consistence of Pus. The Person in ^{the} mean
time is restless, feels a Heat, cannot sleep, or if
He does fall asleep is awaked or much disturbed,
with confused & frightful Dreams. In several
cases the Swelling is much greater than I
have described, it extends the whole length of
the Arm, down to the Wrist, and upwards to
the top of the Humerus, and mortifies in different
places; first the Scarf skin separates, then
large portions of the true skin becomes black,
and falls off, and the mortification may
extend down the Forearm a good way.
At length a Delirium begins to appear,
The Patient is opposed to Matter, and to speak
a good deal incoherently; When He is asked
any

837.

any question I should, He answers very
distinctly, but on being left to Himself the
Delirium again appears. After this has
continued some days, the Patient is at
times seized with more violent fits of Delirium,
and at length perhaps has convulsions; the
I do not recollect to have seen these, except
in one case and Dies unexpectedly perhaps
after a violent struggle and Delirium.
During the whole progress till near the end,
the Pulse is seldom under 90, not often above
100, and does not feel very full or strong, as
in a case of mere Inflammation, but rather
has a degree of inequality and Debility.
In one or two Cases I have seen the Pulse
at 120 or upwards, but find it does not extend
90, or 100. Now this is the progress of
this

852. This I complain of; And, To what are we
to ascribe the Symptoms? Are we with
Surgeons, going to imagine that they depend
upon the Rupture of the tendon of the Plicif
or of its aponeurosis, or are we to imagine,
which I do, that they depend upon a wound
of the substantaneous nerves? Now let us see
what we would conclude from our knowledge
of the Structure. Those surgeons who imagine
that the Symptoms depend upon an wound
of the Tendon, or Tendonous Aponeurosis, if they
understand at all the Economy of our bodies
and reason from just principles, must conceive
that the injury is transmitted by the Nerves
of the tendon, which is the only part of us which
is capable of communicating any impressions.
Now, is it more reasonable to ascribe the Symptoms to

853.

to Nerves which are so minute, That no
Anatomist has given a Demonstration of them;
Look into Haller, He has never found a nerve ending
a Tendon, Nay, Denies They have any; but whenever
We find a Bloodvessel, we know that it derives its
power from Nerves; But all Anatomists will
admit That They are so very minute here, That
no distinct Demonstration of them by Dissection
can be given. So it is more probable That the
Symptoms Depend upon large Visible nerves
such as run under the Skin, than upon those
which are so very minute & Invisibile - Now,
next let us see, Whether Surgeons in this opinion
are consistent with other parts of their own
practice - Now do they treat wounded Tendons?
or what account do they make of them? Do
you find these very Surgeons who speak of the

854. The great Danger of Wounding this Aponeurosis,
alledge That a high Degree of Danger attends ye
wounds of other Tendons? So far from this That
They have directed to have Tendons sowed together,
and have contrived Needles for that purpose;
and as these have been frequently employed
it must have been without occasioning such
very bad Symptoms. Next, Consult Haller and
the many accurate Authors he quotes, who have
made experiments for the purpose; They concur
to show That Tendons when Wounded give no
Pain, and That Wounds of them are healed
without any bad Symptom; I have occasionally
made such experiments, and I find That the
may cut & tear the Tendons of Animals
without their complaining more than if you
do it to the Tail or the substance of a Bone,
May

277.

Now, in the Human body I have seen Tendons
and Tendinous Aponeurosis laid bare, and I
have incised them with probes, and in several
cases I have decided that they should be divided, &
without finding any bad consequences attending
the operation. Thus in the case of the Aponeurosis
Palmaris & Plantaris being wounded & punctured
by accident, Nails &c I have seen in
here to a great depth, but without any remarkable
Pain or bad Symptoms. In like manner I have
cut the Aponeurosis of the Temporal Muscle
to be repeatedly opened by incisions, and the
Dress applied to this part of the Cranium —
I have incised this Aponeurosis with the sharp
end of a Probe without the Patients feeling any
remarkable uneasiness. In like manner I
have seen the Aponeurosis divided in the
arm

856. arm & puncher I. I have question I Marry
Surgeons who have bled frequently, if they were
not often sensible that from the Patients arm
starting they went deeper than the skin, and
they have acknowledged that they have
found the point of the lancet rest upon the
Aponeurosis without bad consequences; May
so inconsistent are those who ascribe the bad
consequences to the puncture of the tendon, that
it never enters into their imagination to consider
that in every Aneurism the Aponeurosis is cut
thru; Now do we find that such swellings and
bad symptoms are the undivided attendants
of this Disease? By no means; They are never
mentioned; Yet the Aponeurosis in its thickest
part must be cut thru to wound the Artery;
or where the Surgeon is to cure this Aneurism
Now

837.

Now does Mr tell about it? After dividing
the Skin He proceeds to cut the Aponeurosis
Deliberately from which He conceives is greatest
Danger, and as every Bundle of its fibres is like
another, the further He makes the cut, the more
He should add to the Symptoms. In the manner
of Nerves in other parts of the body perfectly similar
to the Subcutaneous produce fatal Symptoms, where
no Tendons or its Aponeurosis are at all affected.
Thus it is known as a fact, That the reason is
not attended to, That slight punctures about the
sides of the Fingers have produced these symptoms
where the Nerves running at the side have
been punctured. So I knew the case of a Lady
who wounded her finger with the point of her
needle, and was very near losing her life
for the whole hand swelled surprisingly. In

358. In like manner I have seen a very great degree
of swelling in the forearm occasioned by a puncture
of the Nerve at the side of the Thumb, made by a
minute particle of glass, & the hole in the skin
did not admit freely the end of a common Probe, a
Window glass had broke, and the Drawer had not
swept away some of the Pieces, and in pulling
the Bottle close to him he scratched the side of ye
Thumb at a distance from the laceration; the arm
swell'd most prodigiously, was quite discoloured,
a vast quantity of foetid matter was discharged,
and bled the whole Forearm as high as ye
Joint there was a fluctuation, and causing
an Abscess to be made thro' the Aponeurosis
of the Biceps first, then between the muscles,
about a pint of matter was discharged,
and no bad consequences attended the
wound

839.

wound of the Aponeurosis. Some time ago
I was called to another case where the point
of a nail had entered thro' the skin in the
middle of the calf of the leg, it produced a
swelling of the part, and all the other symptoms
I have mentioned. I apprehended that it ^{must} ^{be} ^{soon} ^{fatal}, and I explained my ideas
of it to the Surgeon, That the Subcutaneous Nerve
was punctured by the point of the nail, and I
proposed making an incision thro' the Nerve,
but it was not agreed to, & the Patient died next
morning. On examining the Leg the Surgeon found
the Nerve well, hard & discoloured, and the Nail
was not so long as to reach any other Nerve
which was more material, and there is no
doubt from Aponeurosis here across the Arm
to produce the symptoms; May, I have known
one

860. An instance where Death was occasioned by pulling a tooth; the sides of the Head swelled after the operation, the Patient had no particular complaint, and there was a collection of solid matter under the Aponeurosis at the bottom of the Cheek; so such Cases can occasion fatal symptoms.

Now let us attend to what in reality happens in the cases before us. They were all such by accident as put this matter in the clearest point of view. If you take them together there may be a danger of concluding from a single case, but take the whole of them, and they evidently prove the point. In the first case which I saw, the Patient was blooded in the Cephalic vein for a slight cold, and a Rheumatic pain about the Ankle of the back, and was without any degree of fever. The arm swelled

incom-

861.

immediately after the accident, and the symptoms
I have mentioned took place. In the second case
The Man was riding, The Horse slipped under
him, & hurt his knees, The Man was not hurt
so as to occasion any material complaint,
There was no consciousness of the Wound, nor any
complaint about the arm, But his Master to
prevent bad consequences, persuaded him to
draw blood. In the Third Case, The Patient
was let blood merely on account of a few pimples
on his face, when he conceived he was owing to a
Heat of the blood, and what was still more re-
=markable in this Patient, He had been bled
seven years before for a slight complaint, when
His arm swelled greatly, & He had a dangerous
fever. And in the case which I sent to the
Infirmary, where there was the Mortification, The

862. The Soldier was coming down from England
with his Wife, and offering some punctures on
their Skin, They imagined They had got the
Itch, and agreed that they should let a little
Blood. There was no appearance of any dangerous
eruptions in other part of the Mans body, nor did
any appear on the Wife, so that we cannot
suppose there was a malignant Distemper,
In two others, who were very near dying, Blood
was drawn, after drinking some liquor which
had made them sick. In the Cases before us
the Patients were not reduced by any previous
Disease, but there was a quantity of fat under
the Skin, and the Veins were at a distance
from the Aponeurosis, and in two of 4 Cases
the puncture was made in the Cephalic
Vein, an inch & half from the bend on of the
Wrist,

Biceps; In the third case the puncture was
 in the Median Basilic vein, but on dissecting
 the arm, there was no room to suppose that
 the Surgeon had struck thro' the vein, nor was
 there the smallest appearance of any wound
 given to the Aponeurosis. In this and in all
 the other cases the swelling did not affect the
 Biceps, neither at its belly, or tendon, they were
 unconnected; the tendon when slit behind
 could be pressed in without pain, as did the
 Patients bend the arm without such a pain
 as would occur in a Member that is violently
 swelled and affected. In some of the Cases, so
 often have ready been mistaken for Case
 of Disorder, It was supposed that if swelling
 was in the Biceps, but it was much more
 superficial. Some that Case which I sent to

864. To the Infirmary, Mr. Chalmers Surgeon had
believed with others, that the swelling affected
the tendon of the Biceps, but he allowed me
to mention his change of opinion, as being quite
convinced that the tendon was in no shape
affected. So there is no manner of doubt that
the wound of these nerves produces symptoms,
and that they do not depend upon a wound
of the Aponeurosis, and there is not a single
case which proves that the symptoms were
occasioned by wounding the Aponeurosis. Nor
will it be easy to frame a case that can do
this. I believe that the nerves under the skin
being wounded produce these symptoms, now
suppose the bleeding to be over the Median Nerve
where the nerves are small, and that the
Surgeon strikes his lancet thro' the vein into
the

865.
The Aponeurosis, still that Aponeurosis may
depend upon the status between the Mem and
Aponeurosis. The determining this point is
not mere matter of Curiosity, but it is of the
utmost consequence to do it, in order to enable
Surgeons to avoid such accidents, and to direct
in the treatment. For if it depends upon the
Aponeurosis, we have only to use a sharp
Scalpel, and not to plunge it deep, or to enter
the Canal obliquely; but if it proceeds from
a wound of the Subcutaneous nerves, First,
we lessen the danger by avoiding these veins
which are attended by principle nerves, and
now I would alledge that we ought to avoid
partly the Cephalic & Median Cephalic, which
Surgeons consider as the safest, being both at
a distance from the tendons and the artery;
In

866. In the manner we would avoid the Basilio
Vein on account of the Branches near the Infimal
Scindyle, and would draw blood from the
Median Basilic. The danger of wounding the
Tendon is out of the question, and will seldom
happen unless the Patient starts. Next, the
place of the Artery may be almost always
avoided, because that Vein being about 1 1/2
Inch in length, the Artery in crossing it only
occupies the quarter, and there is yet a whole
Inch free for the operation. May the danger
happen less frequently in the Country
because Gardeners let blood from this Median
Basilic Vein, they take the biggest which
bleeds most freely, and the size is another
security against the danger of going deep.

Next, when the accident does happen, in what
manner is the Surgeon to treat it? Of the
Patient

864

Patient immediately on the puncture complains
of sharp Pain, and that with all the care we
can use of keeping the Arm at rest, & allowing
the Vein to discharge more blood than we intend,
the Swelling increases with the Pain, I would
certainly divide the Wounded Nerve. Amputation
done on the larger Members sufficiently proves
the great Difference there is between a total
Division of a Nerve, and a partial one, where
the Nerve is extended & limited, the Degree of
Danger here vastly exceeds that from the
Wound of the Nerve, and even in these cases
before us, I did not find that the Branches of the
Subcutaneous Nerves were punctured, I only
saw Branches from them running into the place
wounded, & a swelling continued to the Mouth
of the Nerve. And in one of the cases the operation
was done over the Median Basilic, where the

868. The Nerves are still more minute. Now that
leads me to observe after the letting blood, the
necessity of rest, it should be a general rule to keep
the Patient's arm at rest till there is no danger
of such a swelling, as the motion contributes much
to the danger. So an inflamed Nerve is more violently
affected than one which is not inflamed, then
there is a sharp matter produced which hinders
the closing of the Wound, or at least the wound
does not close, and the vessels about the wound
produce it, but it may react upon the irritated
Nerve as a poison, at least I suspect so. Now
then if the Patient will not allow the incision
to be made, let us relax the arm, apply Emol-
=lients, & pursue the Antiphlogistic method. If the
Symptoms grow dangerous let us repeat the
attempt of cutting the Nerve, and tho' we may
not

not prevent the progress of the Symptoms we ^{shd}
may relieve them. I tried that in two cases, in
the one that was hurt on the side of the thumb,
I had the Nerve fully divided, a finger's breadth
higher than the puncture, from the Tendon of
the Flexor, to the sheath of the Extensor, and
in another I made the Surgeon cut across the
Nerve, & make an incision more than an
Inch in breadth, in both the Sympyl Cerebrum
and were dangerous, yet it is probable that
their proving fatal was prevented by the
Incision; For in the other cases where the
swelling was less, the Brain less affected
and the Patient less weakened, the Symptoms
prov'd fatal, where there was no incision.
But after the affection is communicated to the
whole Nerve, no incision will put an end
to the complaint. Thus I have seen a
case

370. case, where the last joint of the thumb was
tore almost away, which occasioned a locked jaw,
and one of the first things done was to cut the
thumb off near the root; yet the symptoms continued
and the Patient Died. Now, besides the measures
commonly used, as the taking blood from the
Neighbouring parts by leeching & cupping &c.
We would try Musk & Opium, which have
been found of real use in lacerations of the
fingers & Toes, and in cases of Hæmatoma, and
Mercury may in some be discovered to have
real effect, but the Musk & Opium have a
more immediate operation. I am in doubt
what kind of application ought to be made
to the wound. At the same time in the
Tooth-ach, where Nerves are irritated, Ardent
Spirits &c. do not really abate the pain, and
render

Under the Nerve Gallies, whether Nerve No. 8th.
should apply these substances, as the sometimes
covering the Inflamed parts with a Poultice
experience alone can determine.

Lect 6th

We proceed to trace the Vessels & Nerves on
the containing parts of the Thorax.

The Subclavian Artery sends a considerable
Vessel within the Musculus, called the Internal
Mammary. There are besides six branches
from the Brachial Artery, named the External
Mammary Artery or Thoracic. Now with
these we are under the necessity of examining
the Vessels at the lower part of the Throat, as
certain circumstances are supposed to attend
their union; and as a part of the containing
organs of the Throat we shall examine
the Structure of the Mammary, then laying
open

872. open the body we are led to the Heart and Lungs. The former has been fully considered as the origin of the Vascular System, it only remains to show the origin of the Nerves. So we would next examine the Structure of the Lungs, and as formerly you saw not only the Air vessels, but in demonstrating the Heart, the three terminations of the principle Pulmonary Blood vessels, we are sufficiently prepared for examining the Structure by dissections. Besides the Int^l Mammary Artery which runs on the outside of the Pleura, between it and the Costal layers of the Ribs, thro' the Pectoral Muscles into the Mammary, we find a vessel called Epigastric, coming from the top of the Thoracic Artery, running within the tendons of the Lat^l Abdominis, and upward

879.

upward to the middle of the Neck, where it
meets with the termination of the int. L. Mammary,
and we can here see communications as large
as a small Bristle.

From attending to the course of the larger blood-
-vessels which have been demonstrated, we
would say of them, That communications are
repeated as often as possible to guard against
obstructions arising from pressure, action of
the Muscles, or the situation of the body; and
That in surgical operations we would avoid
these larger trunks. In performing the
Excision of the Mamma we can stop the
flow of blood by pressing the Trunk of the
Subclavian against the first rib; if the blood
flows from the outer end of the Mamma;
but it continues thro' the Internal Mamm. L.
In the lower part of the body we avoid the

874. The Circumflexus of the Uterus is doing great
for the Uterus; and in cutting the External
Oblique, we use the Knife like a Saw, lest we
divide the root of the Epigastric Artery, and in the
Female the round Ligaments, and in Man
the Spermatic Chord. In the manner in the
Caesarian Operation instead of avoiding the
Tendon of the Linea alba, we would cut
between the Recti Muscles, as even an oozing
of blood here may be attended with danger,
by falling into the cavity of the Abdomen.

Now, I do not find time or room for making
useful remarks, but Bowdich and Dr. Cate
Dr. Whigte with several others, explain the
Remarkable Flow of the Milk with Nature's place
after Delivery, from the communication of
the Epigastric Artery with the Intest. Mammary.
Not

875.

For when the Uterus swells, & they, at Delivery
collapses, there is at first a very large Discharge
of blood from the internal part of it, but when
this begins to diminish, & the Uterus has become
harder & smaller, less blood is circulated thro' it
and a greater quantity is pushed into the
Neighbouring branches, & part 4 into 4, Epigas-
=tric, from which it runs upwards & into the
Mamma; and to support this Idea they observe
that in like manner, in Children after tying
the Umbilical Chord, by which 4th momentous
seems to be increased in the Epigastric artery
there is a flow to the Breast soon after Birth.
Now, notwithstanding these plausible arguments
this opinion wants a solid foundation.
For, first, if Nature had in this manner occa-
sioned the flow into the Breast, in all the variety of

876. of Animals the Breasts would have been
placed near the uterus, and the inconvenience
of the Mother holding the Child to a lower
part of the body would have been disregarded.
or the Epigastric would have been the only, or
the principle Mammary Vessel. But the Epigas
and Mammary Arteries are joined together by
a small Anastomosis, by their very Apices;
whilst the Mammary is supplied by Internal
Mammary, and the Other Thoracic Arteries.

Now, can we conceive that the current of the
blood is from the Extremity of an Artery into
its Thrust, or that it passes into the extremities
of the Mammary Arteries from the extremity
of the Epigastric and so reaches the Mammary?
Certainly not a single drop of blood entering
the Epigastric Artery reaches the Mammary
in

in a sound state of the body. Suppose the ^{877.}
Internal Mammary taken up by a Ligature, &
that the Epigastric only communicates with the
Mamma, the Milk may be sucked from that
vein, but supposing the flow to continue as usual,
more of the blood will flow in that vein. And I
would venture to alledge that we shall not be able
to prevent the flow of Milk to the Mammary Duct &
the Epigastric vessel. Nor has any Anatomist once
proposed to make a purpose on the Femoral Artery
to make more run thro' the Epigastric when there
is too little Milk, or in the case of too great a quantity
of it do they think of making a purpose on the Veins.
Both which experiments should succeed supposing
this opinion is just. Therefore we can by no means
admit of this supposition. But next, What are we
to substitute in its place? I think another Supp
is very obvious; I shall not descend into all
the

878. The Manner of Arguments which may be used,
But whatever opinion you may form concerning
the Cause of the Menstrual flux, Whether That of
Women are intended to nourish the body of a child
as well as their own, That therefore by their form
they prepare more nourishment than is sufficient
for themselves, or a fullness, a general Plethora is
occasioned: Whether you admit this supposition or not,
We must allow That for Nine months the Constitution
has been in the habit of preparing more than is
necessary, and this once begun remains sometimes
after Delivery. As soon therefore as the Vascular
System comes to accommodate itself to its contents, &
the Coelical Exchange happens, The Vessels likewise
are not able to act with vigour, but recovering
their Tone, which Vessels do very accurately, then
the effects of their fullness is felt, which is relieved
by the Coelical Discharge being free, and the
Woman

Woman giving suck, and by sweating, and ^{879.}
other Artificial evacuations the symptoms of Melancholia
are relieved. So in a short time after Delivery there
is introduced a fullness in the Vessels; But I would
take another view of the matter, and I wd observe
next that the same kind of secretion & nourishment
is necessary for the Child immediately before and
after Delivery, therefore I wd observe a resemblance
in those vessels which make a communication
between the Mother & Child, and which separate
the Milk, I find in the Uterus of all Quadrupeds
Glandular Masses which secrete a fluid that we
are scarcely able to distinguish from Milk; When
therefore by the Uterus collapsing this secretion is
went on before Delivery is stop'd, the Matter
more readily affects the Mammary than any
other part of the body. Just as when a Peripneumonia
is

880. is affected, the liquor which usually passes by
the skin, more readily runs to the kidneys than
to the other glands. So the flow is to the vicarious
organ that resembles the part of the uterus and
its office, and the discharge is increased by the action
of the child. As for the fullness in the breasts of
children, and that happens in mammae only
there might be an appearance of argument,
but we see this taking place in every gland in
a similar degree. By the respiration taking place,
and the change of the circulation the force of the
left ventricle is greater than it was before, for
instead of $\frac{1}{3}$, after birth the whole blood passes
thru it, and the action is increased in every gland,
thus the bile which for nine months was only
sufficient to tinge the Meconium, is after birth
not only fit to tinge the faeces, but to give a

a yellow colour to the whole body in a disease ^{881.}
called the Gum, so there is nothing particular
in the increased quantity of liquor in the breasts
of children.

Lect. 6^y M

With regard to the structure of the Mamma
You have seen the glandular part thereof buried
in fat, which You will consider merely as giving
a defence to it; For We are not to admit that the
fat about the Breast passes directly into the
Lactiferous ducts to be mixed with the Milk, For
this would imply that the fat is contained in
organs here, which is totally different from what
it is in other parts of the body, in other places
it is contained in minute coherent cells, whereas
here it must be contained in open sacs. Now,
What proof does Dr. Haller, who is of this
opinion

882. opinion, give of such a communication?
That He saw Branches of the Lachryous Duct
with the Naked eye in the fatty substance,
and That in injecting Mercury it got from
these Ducts into the Cellular substance. But the
Ducts are here tender & easily burst, so the
whole of the Liqueur that is poured out from
the Papilla comes from the Arteries immediately
into the Lachryous Ducts. The Ducts run
without communication till they come
near to the Nipple, and even then these
communications are less frequent than
Some Authors of Eminence have supposed,
there is no general circle of Anastomosis of the
Ducts of the Nipple, but two or more joining
together forming pretty numerous commons.
at

At the root of the Nipple the Ducts are very suddenly contracted, & in the passage through the Nipple they are in some respects serpentine as appears from finding the Nipple an Elastic substance even in a Dead body. In sucking they are made strait by which the Nipple comes to be distended & creased, without our knowing well the manner in which the erection happens, as I have not seen such fulls here as was Demonstrated in the Penis, yet the swelling is considerable. Around the Nipple there is a Circle of a darker colour where the Sebaceous glands are placed, which pour out an Oily matter merely as a Defence of the Skin, and sometimes Laciferous branches terminate here. Next, You have all observed the manner in which a Child draws
 suck

884. Such, tho not perhaps attending to every
circumstance, By an instinct of Nature
after the child has grasped the Nipple which
occasions a swelling of it, It holds back its
head, whereby the Ducts are brought more
nearly into straight lines; and by same
instinct, the hands are applied to Breast
in order to make a Mechanical pressure;
at the same time the air being excluded
the child makes a Degree of Vacuum by
pulling back the Tongue, while the pressure
of the surrounding Atmosphere forces the
Milk into the Mouth.

Having seen all the Branches wh. come
off from the Subclavian, We must trace the
Descending Aorta, which in its course sends
off a number of small vessels, as Bronchial
Ar-

885.
Arteries to the Lungs. The principle Left

Branchial Artery comes immediately from
the Aorta, while on the other side, ^{the} principle

Branchial Artery is derived not from the
Trunk of the Aorta, but from the 1st Intercostal.

So the blood which the Lungs receive comes
from the Left side of the Heart, & returns to
the Right by the Branchial Veins.

Lect. 68th

Formerly, besides showing the Bones, Ligaments
Joints, Cartilages, & the Muscles of the Thorax,
with their manner of acting in Respiration
and the use of the Pleura & Mediastinum, you
recalled that I likewise demonstrated, as
far as could be done by Dissection the Structure
of the Lungs; but many more circumstances
are now explained to us from the Preparations
I

886. Your attention to this is not merely a matter
of curiosity, but of real use, as establishing our
views in practice, and therefore I shall be very
particular concerning it. And

I begin with the Air Vessels, as being is found in
on which the other parts may be supposed to
be built. They come down from the Larynx,
I need say nothing of the Structure of that
part, which is already sufficiently known;
You have found that the Trachea Arteria
Was found to its cartilaginous rings, Musc-
fibres, which appear not merely where they
are first described, but in every instance
of the Ring in its circumference. And We see
the Recurrent Nerve in its passage upwards
along the Back of the Trachea adhering to it,
for it is evidently smaller at the Larynx, than
at

334.

at the bottom of the Neck. The Muscular fibres
are lined with an Internal Membrane, by
means of Cells &c, and in this, Glands are
placed, which open into the Cavity of Trachea,
and their orifices are quite distinguishable
by the naked eye. Pursuing the Trachea
from its Division into two great Branches
to the Right & Left Lungs, we observe the same
genl structure evidently continued for a very
considerable way, we find Muscular fibres sup-
ported by Segments of Cartilages. But now
as there was no reason why these should be
in one part more than another, they are
disposed in an irregular manner in the
whole circumference, serving to support
the sides of the large Branches of Trachea
from

888. From being squeezed together, yet allowing a
sufficient action of the Muscular fibres, for short of
the Branches of the Trachea, as also for agit-
-ating the Mucous glands, so as to promote
their secretion. Then we find the cartilages
gradually growing smaller, and at length
entirely wanting. & at the same time the
Branches of the Trachea seem much thinner,
so that we cannot demonstrate anything
like the Muscular fibres, but we see Tubes
which are Membranous. These tubes lead
us to the Minute Cells which are proper to
the Lungs, most of which are of the same
size. There is no inequality of the size, but they
gradually grow with the body. There is not an
addition of new cells, but an enlargement
of the old, being much more minute in a

a Child than in an Adult. The Branches ^{389.}
leading to these Cells are visible to the Naked
Eye, They may even be Measur'd, & I suppose
That They are at least equal in their Diameters
to the 200 part of an inch, and They are smaller
than the Cells with which they correspond.
We find Descriptions of Cells, 100 Years ago, But
They had no method of being sure of their
facts, and They conjectured That They were
like Branches of grapes or Berries, & shut;
whereas They are all open and communicate
with each other, and there are many more
Cells than Branches of the Trachea, or Every
cell does not immediately receive a Branch
of the Trachea, but the first Cell opens into
a second, and this into a third, so that the
communication is extremely free. The
Subules

890. Lobules adhere to each other on the very surface of the lungs, and I can blow up a large portion of the lungs, from a small branch of the Trachea, without using force to burst the lungs, for the Air passes readily from one lobule into another, before we extend them so as to fill the Capacity of the Thorax.

Are we next to imagine that the Cells of the lungs are Muscular? This is a very common opinion & is carried into practice by Physicians, as when a Person is struggling with an Asthmatic fit they conceive that the lungs are contracted. But we are not to imagine that the lungs enjoy any particular power of contraction. That the Vessels of our Body may be very much affected with Spasm is owing to their Musc. Nature and the same thing may take place in the

the lungs. Next, this appearance of Mucos 891.
in the body of the lungs is apparently increased, or
we are deceived concerning it, by the contraction of
the Glottis, the power of the muscles there not being
sufficiently attended to, and we often ascribe Con-
tractions to the lungs, the seat of which is in the
Larynx, and Diseases affecting the Larynx, put
on very much the appearance of Pneumony.
So I have observed that on undulating the Larynx
of a Dog he was thrown into Asthmatic fits, and
by making a stroke there I bring on a fit of
that kind. But we are not to imagine that
the Cells of the lungs are chiefly Muscular, this
appearance ends with the great Branches, and
in the Cells is altogether wanting. In living
Animals I have felt the Lungs wth Acrid
sds

Substances without offering the smallest degree of motion by the action of the Air, they collapse to a certain degree, but unless we apply substances that coagulate blood they are not further affected. But further, this supposes that the Lungs could draw themselves from the Pleura, could make a void between them & the ribs, and overcome the pressure of the Atmosphere. So where there is a contraction it is in the Vessels dispersed on the Cells over the Larynx.

Next, I should show that the Lungs have a very dense proper Membrane, and we are not to imagine that the Cells of the Lungs are in some measure the continuation of the cellular substance of the Pleura; it is quite otherwise. Surely from such an idea we could not find a

a reason why the air of the Lungs should not
 get into that cellular ss, & produce an Emphysema; Or why Water in Anasarca does not
 pass by the Lungs, so as to be discharged by Coughing.
 But on pushing an Injection with violence, the
 colourless Water only exceeds that thin Membrane.
 The proper Membrane enters into the interstices of
 the Lobules, and adheres to the surface of it Cells
 carrying with it the Cell's substance, so allowing
 Lobules to play upon each other, and over all
 the Pleura is spread out like Cracked
 Coat of the Brain, to add strength to the Lungs
 to prevent them from being hurt by the
 hardness of the ribs, & that they may adhere
 the Pleura being there. Supposing the proper
 Membrane of the Lungs burst, an Emphysema
 would

894 would be found, or if the Perfora was supposed
the water would be discharged by the lungs.
Again, where this Membrane is entire the
water may be found between the Pleura, and
the proper Membrane, but by use the two
Membranes come to grow together, so that in an
adult body can be given a proof of a Double
Membrane, so that for ordinary the two membranes
grow together, and both of them are made thinner,
than any of them taken singly is originally.
Hence perhaps Haller by examining Subjects
too far advanced in life has been led into
a Mistake.

Next, Attend to the Blood vessels, beginning at
the principle the Pulmonary Arteries, and
their corresponding Veins — Many Authors
pretend to find a vast disproportion in the size

895.
Size of these Veins compared with the Arteries;
That they are smaller than in other places, but the
proportions have been exaggerated. We are to
recollect here, that with other deep organs, there is
but one set of Veins, so we are not to compare the
Veins & the Arteries with those of the arm or leg, nor
even with the great trunk of the Veins; But
they are perhaps somewhat smaller than the
common proportions in the Kidney, and some
other organs. And we do conceive that any
great condensation of the Blood is made
in passing thro' the Lungs; Surely by no
means; We are merely to suppose that the
Blood passes quicker thro' the Pulm^y Veins
than thro' those of the Kidney, and we may
explain this First, Nature subjects the first
mass

896. mass of our blood to compression here, so the
veins are made somewhat broader that the
efflux may be better obtained. Next, by a greater
current of the blood in the veins or greater irrita-
tion may be given to the Left Ventricle, whereby it
may exert itself with more force in stimulating
the Ventricle, in order to throw the blood to a
greater distance thro' the body.

Next, attend to the Division of the Pulmonary
Artery, and the force of the blood thro' it in diff-
erent parts, and first, Altho' the quantity & Velocity of
the blood be nearly the same (not exactly)
in the Pulm^y & Artery & Aorta; yet the force in
the Aorta is much greater, & therefore is less
in the Pulmonary Artery in proportion to the
Mass of the Ventricle, there is less momentum
in

367.

in the Trunk. But let us not carry our Opinion
too far, for the force of the Right Ventricle is confined
afterwards in the small branches of the Artery
to a much smaller field, and not only the
Velocity, but the actual momentum is greater
in the ultimate branches than in similar
branches of the Aorta; and we may from
this explain a fact, that wounded Vessels of
the Lung bleed with remarkable violence,
For tho' the force of the Aorta be as 9 to 1, yet the
field may be as 15 to 1.

The next fact is the communication of the
Pulmonary Artery with the Vein, which are
remarkably large in the Dead body. I can make
a course injection pass from the one Vessel
into the other, which is very difficult in the
Aorta

898. Aortic System. As the velocity in the minute branches from the want of resistance must be considerably greater.

Now, You have seen added the Pulmonary, the Bronchial vessels, which tho' small are yet constant. Viewing this organ alone we might conclude that they came there by accident, that the Aorta calling Branches on all sides, a few ran out to the Lungs. But considering what is found in the Heart, that the left side of the heart sends Arteries to it, & the right receives all the Veins, and that there is an Artery added to the Liver, tho' it is otherwise supplied with a vast quantity of blood furnished by the Veins of the Neighbouring organs. Some very material purpose is evidently served by the Branches—

899.
Bronchial vessels, the purpose perhaps by
no means well known, one only is mentioned,
To nourish the lungs. Now I would subscribe to
this, because I think the parts of the body are
nourished chiefly from Arteries, and not from
Nerves. But there is something more than this;
all the nourishment for the whole body is known
first to the Right side of the Heart into the Lungs,
while there is no want of nourishment there
the great mass passing thro' them, with plenty
of Nutritive particles floating in it. So I would
infer only this great circumstance, that from
a single circulation there is a prodigious
change made upon our Mass of blood, wh.
unfits it for necessary purposes, for tho' the
whole mass after undergoing a circulation
enters

900. enters the lungs, that is not sufficient for answering many purposes, but a vessel from the Aorta is added, or there is a something in the lungs by which the blood is restored to its proper condition.

Next, the Bronchial vessels are spread out like a Net work on the inner side of the Trachea, & communicate with the Pulmonary Artery. Experiments have shown this long ago, and Minster describes communications of the Bronchial Artery with the Pulmonary Vein, but he had mistaken the Veins of the Lungs for the Arteries, and had blown up a lissu matre where the Bronchial Artery is joined to a Pulmonary by a large branch; in all there are small communications. So it is in vain to proceed with Van Swieten to distinguish an Inflamⁿ of

of the Pulmonary from that of the Bronchial ⁹⁰¹
Vessels by external symptoms.

Next, I thus attend to the sections that are
made from both Vessels into the Cavity of the
Trachea. There is first, a section of a somewhat
that is shut full to us. You all know that the
Breath of an animal collected can suffocate another.

Now this happens is not full, & I am sure, but
We know the fact, and there is another circumstance
which explains it a little further, and which I
have seen Dr. Black demonstrate long ago.

Thus if you take a bent glass tube, and pour
a little lime water into it, then take hold of
one end & inspire, you make the air pass thro'
the water to reach your lungs, and there is
scarcely any observable change in it. But if
you expire, the crusts of the lime appear,
i.e.

gor. i.e. fixed air is added to the same water,
and the same restored to its original state. Now
we do not well know how this happens; but
just we would think a quantity of fixed air
is passing out; the air we have taken in
may be changed, so that the fixed air is afterwards
readily separated from it. But for our purpose
it is sufficient to say, that something morious
is thrown out. And this appears curious, the
more that the lungs which throw it out are
more easily affected than any other organs
of the body, tho in other respects seemingly equally
sensible. And we do not by dissection discover
particular organs for making that exhalation,
yet the extremities of the Pulm^y and Bronchial
Arteries are organized in a very curious manner,
and

and I believe that these kinds of Discharges 903
are not left to inorganic pores, but that Exhaust
Vessels producing remarkable changes are every
where distributed.

Next, Mucus is separated in great quantity &
in the Trachea and its larger branches we discover
the organs readily, and probably the structure
extends further than we are well aware of, though
cannot so easily give the demonstration of these
Glands. This secretion serves as a defence to those
parts which are exposed to the air — Now in
certain Diseases we find Cysts formed on the
Inner side of the Trachea, partly in the Disease
called Croup, or Inflamed Glands, Many have
conceived that these are formed by this Mucus
condensed, and have proposed means for the

964. Separation of the Crust, which they consider as
the cause of the Disorder, and that even Boonch
may be performed. Now, just I would observe,
that as to the Nature of these Crusts, I doubt much
if they are Mucous; They appear rather to be
chiefly formed by the exudations of the Vessels, or
to be an Inflammatory exudation, or a mucus
is chiefly formed as in other cases of Inflammation
where an adhesion of parts is about to take
place, or where air is admitted, & an Inflammation
is excited. To this Gist becomes much tougher
by the addition of Spirit of Wine, w^{ch} produces
little change in ~~Purulent~~ Mucous. Therefore the
Crust is the consequence of irritation, & not
owing to a more relaxation, nor the cause
of the Disease. And where such Diseases prove
fatal

905.

Fatal, it scarcely happens from a Membrane,
It is possible that Mucous may be detached from
the side of the Trachea, but the Patients generally
die before the separation has taken place, and
whilst the Membrane continues to line the Trachea.
Therefore it is a cause of the Disease, because about
the Crisis it separates. Now in the Malignant
kind of sore throat, which is perhaps nearly
allied to the Croup, Physicians don't consider the
Crest as the cause, and tho' we'd prove it to
be the cause, we have no method of detaching
the Crest, so such an operation is altogether
out of the question.

Besides the Glands which separate the Mucous
You recollect to have seen a number of Glands
of a much larger size, some equal to the
size

906. size of ones finger end, connected to the Trachea, at
its Division chiefly, but extending some way along
the Branches, & are commonly named Bronchial
Glands. Now, what purposes are ascribed
to them? You will find that it is a common
opinion, that these likewise make a secretion
into the Cavity of the Thorax. Some few have
differed from this opinion so far as to name them
Lymphatic Glands, as Meisner, but at the same
time they suppose that they perform a function.
So Haller explains this at great length, & Senac
is quoted in proof of it. Now we are to consider
them as merely Lymphatic, without having
any connection by Ducts wth Trachea Arteries.
The circumstance which has led Authors to
conceive that they perform a secretion is
indeed

indeed very apt to mislead us, That we 907.
Awake by coughing in the Morning, mix'd
with Mucus from the Lungs a dark coloured
Liquor like ink. Some have supposed this to
be the effect of the Smoke we draw in by breathing
in Town; but it happens every where, whereas
the Glands which secrete the Mucus are of
a Rosaceous Colour, but the Bronchial of this hue;
Now, how are we to explain the colour of the
Mucus of the Glands? Amongst the same there.
That they have no Ducts we conclude first,
That it is impossible, at least improbable that a
Gland shall serve two very opposite purposes;
Next, from their external shape, they appear
like the Sympathetic Glands. But further I've
Repeatedly traced them with the utmost
care

908. can without either offering Dust, or any
liquor pour'd into the Trachea; and in Senae
we find no proof of any such Dust, the speaks
of them in a vague & doubtful manner, and
not as a fact consistent with His knowledge.
The colour there is in this way, that somewhat
dustful which we blow out, carries the colour
with it. The ancients used a Mixture which
I would willingly restore, that of Pulleyanous
Vapours discharged from the lungs. The colour
is discharged by the extremities of the Bronchial
vessels into the cavity of the Trachea, just as a
Black Pigment is swept from the choroid coat
of the Eye. But that such a secretion takes
place is owing to the colour of the lungs, which
by age constantly varies. In a child they are
of a lightish brown, and they gradually grow
more

more of a black colour, and the Bronchial Gland
stands forth, thro the same gradations of colour,
and constantly you find the colour of the lungs
and of these glands correspond. The colour of the
lungs is not owing to the matter within the
cavity of the Trachea, but it is diffused & makes
part of them, it ^{not} only passes into the cavities of
the Trachea, but it makes a part of their solid
substance, Just as the Earth of our Bones com-
-municates a colour to them, and as there is
a constant absorption of the Earthy matter of
the Bones, so the black colour the body of the
lungs is continually taken up by the
Lymphatic vessels, & carried into y^e Bronchial
glands, which acquire the same colour.
Further, the black glands do not adhere
merely to the Trachea, but at a distance from

910. from it, and are even sucked up on the
Pericardium, in the course of the Sympath from
the lungs upwards; and on examining the
Sympathetic vessels, I have several times seen little
streamlets of black matter within them, just as
we find little streamlets of chyle in the Lacteals;
and by pressing the glands, we can squeeze
out some of this blackish matter. The column
of these glands then is every body's office,
as L. Fortinetti, which is their only one, and
as L. Fortinetti is entirely performed by the
Sympathetics, which is received & passes to the
right side of the Heart. And I think it
probable that we draw in somewhat of air
from the External Atmosphere. It has been
found that if you extract the air from water,
and throw a Fish into it, It dies; Now if the

The lungs, or Gills of the Fish merely throw 911.
out a useless substance, or that the motion of the
Gill flap served to compress the blood, the water
purged of air is as good as it was before; so there
is probably a somewhat useful to Life enters
in, which Mr. Whewell out somewhat thankful;
what Authors call a divinizing Spirit; tho' this
is now a days so much rejected, the Proof of
the thankful matter passing out being so clear.
Next, As whatever we receive is useful is
added to the right side of the Heart, the dif-
-ference which has been alledged to have
been observed between the blood on the
right & left sides of the Heart, does not much
depend upon the addition of somewhat from
the air, but upon certain changes which
the blood undergoes in its passage thro' the

912. The lungs; that there is an extraordinary
degree of agitation, compression &c. is evident
but on which of these that depends, I would
not pretend to determine.

Let us next attend a little to the Nerves of the
lungs, and the several degrees of sensibility, in
which respects the Nerves of Movement may
be remarked.

I begin with describing the Nerves in their
course along the neck; We find the 8th pair
entering the Thorax, sending off Branches
and terminating in the Cystic viscera.
Next, The Phrenic Nerve coming from the
3^d & 4th Cervical Nerves; Next, the great
Sympathetic or Intercostal N^{ve} is connected
with the five last of the Neck to the Sub-
-occipital, and lower to all the proper Cerv-

913.

Cervical, so that before it reaches the Heart, it
has received Branches from 13 different Nerves.
Its connection is continued with the Dorsal
Nerves, a Ganglion forms, & there may be addi-
-tional Branches from the lower part of the
Thoracic sent to the Heart, and these Nerves are
sent in to the Heart between the two Great
Arteries. Hence the all round action of the Heart
was accounted for by Boerhaave, but other
Branches enter without touching upon the
arteries. So the number of Branches are
spread ~~by~~ nearly in proportion to the im-
-portance of the organ to be served. The Diaphragm
has its nerves from the number of others, the
Heart from a still greater number; Nature
guarding against the effect of accident, that
should one or more roots be compressed or

9th. or divided, every part may receive a supply
sufficient to continue life. I need scarcely ex-
-plain this further, That it were better we re-
-tain $\frac{3}{4}$ of the strength of every part of the
Heart, than to lose the full power of any one.
Next, it is evident, That in this part of y^e body
Surgeons are to be particularly cautious;
Tho' were one to examine them, they would
be found to know the gen^l situation of y^e
Nerves, yet in doing operations, they overlook
these, and regard only the large vessels; Tho'
keeping from the Jugular Vein, and Carotid
Artery, they entirely neglect the Nerves; Not
independent of the mere scratching of these
Nerves (which may produce the most fatal
Symptoms) the exposing them to the Air,
Tho'

915.
The motor branches were cut, not the making
a deep incision, and the producing Inflamm
is generally attended with fatal symptoms;
So we are not to tie up aneurisms in the
Carotid artery rashly, for the Nerves are still
a matter of great importance.

Next, we would attend more particularly to the Nerves
of the lungs & of the Pleura. We have seen small
Branches from the 8th Pair sent to the lungs, and
the Dorsal Nerves running to the Intercostal
Muscles, and these lined by the Pleura. Now
let us see what conclusion we would draw from
the use of the parts and the course of 4th Nerves.
We would say that the lungs are not very
sensible organs, because their Nerves are
minute, and experiments confirm this. On
wounding the lungs, and tearing them with

916. with a Forceps, the animal makes no such
struggle as when the same thing is done to
muscles; and in Inflamm^s of the Lungs, y^e pulse
is found to be soft, and the passage of the blood
thro^o them is more languid. Now, the intercostal
Nerves of the side are very much connected with
the Sympathetic, so that if a violent Inflammation
seizes these, it may be communicated in a
mechanical manner to the Nerve, or an Inflammⁿ
of the side may occasion a greater action of
the Heart. Now this being admitted, are we
to make the exception, That if the Inflammation is
on the surface of the lungs the Disease may be
attended with a great Deal of pain, or That the
Pleura is very susceptible of & in consequence
of its sensibility, capable of producing dangerous
Symptoms; or are we with Waller to consider the

917.

The sensibility of the Pleura as not considerable
and rather to suppose, That the very Painful and
Dangerous symptoms attending Pleurisy proceed
from the affection of the Intercostal Muscles &c. &c.
I am much disposed to join with Haller, That
We mistake the true seat of the Pain and of the
Danger, for We seem to see proof of the Contrary.
So McDollon is quoted by Dr. Whist, That on
making a perforation into the side for the Empy-
-ema, the Patient complained of exquisite Pain.
But I have caused That operation to be done three
times, & was particularly attentive to this question,
I scratched & tore the Pleura, & the Patient made no
Remarkable complaint. And I would have
concluded so from this plain circumstance,
What is the use of the Pleura? It is a mechanical
cover-

918. covering to the lungs, & lining to the side, to allow
the one to rub on the other, and I cannot imagine
that Nature would form such a Membrane very
sensible. And I took a probe, entered it at a
hole, & turning the point against a rib, I pressed
the Pleura aside, & the Patient just felt what
I was doing, but no Pain. In another case
when the Lungs & Pleura burst, and where I could
the side to be perforated, I introduced a Bougie
Pen inches, & turning it round, the Patient
felt something moving, but complained of no
considerable pain; I repeated this some days
after the operation when an Inflamⁿ came on,
and still with the same effect. I have repeated
the Experiment of Waller or Quadruped, viz.
cutting away the Intercostal Muscles, & then
cut & tore the Pleura without any sensible
effect

effect without the animal complaining. 919.

Therefore the Pleura is far from being a sensible organ. Next, only observe how far we have been misled by those Anatomists who talk of Nerves; The Nerves of the whole mass of the lungs are very trifling, and a very small portion of them will fall to the share of the Pleura; and those from the 8th Pair run deep into the lungs, so that we cannot show a single thread connected to the Pleura. It is therefore probable that it is possessed of little sensibility in a sound state. That it is capable of Inflammⁿ I know very well and all doubt. We often find the Lungs adhering to the Pleura, but this may happen where there is very little Nervous influence. To assist I have cut the Nerves of a Frog, and broke the bones of the legs, I see the common appearance of

920. of swelling, thickening, Inflammation, and
the healing of parts, whilst the most irritating
substance did not hurt the animal in y^e last.
where our Lungs are affected therefore You'll
find that the Danger is not the greatest, when
the Disorder is nearest to their surface, but that
the Deeper it is, the greater is the Danger, as the
Trachea is very sensible especially in its large
Branches where the Stems of the Lungs enter.
And where the side is inflamed, the Danger
is owing to the Intercostal Muscles and Nerves
going to them, and we are deceived with
respect to the Pleura, and because y^e Disease
is communicated to that Membrane.

Sept 6th

At our meeting Yesterday I explained the
Structure of the Lungs, and if you collect to

together the several circumstances, which are now known to You, You are able to account for the frequency of Diseases of the Lungs, and for the Difficulty of curing them.

First, The Lungs are exposed more than any other interior organ to Diseases, because the Atmospheric air often carrying with it harmful matter, is drawn deep into them, & entangled in their small & winding cells. Next, as we find that animals are hurt by drawing into their lungs the condensed air wh^{ch} has been expired, or loaded with the Vapours we throw out; We may suppose that sometimes it happens that the external air is unfit for carrying off the poisonous matter, and that the Lungs in this way are hurt. It is surely the

922 The same whether it is retained in our own,
or drawn in, in too great quantity into those of an
Person. Next, we are exposed to diseases from the
constant & alternate motions of the lungs, w^{ch} are
made in a most unequal manner. Often we
make effort with the utmost violence, & besides
the effect which the air may have immediatly upon
the lungs; Disorders may be supposed to arise
from the unequal flow of the blood thro' them
in their different states; Add to this that the
Crude aliment passes first into our lungs
& after the Mucous & Chylous Lances are filled
with food the flux is very considerable, & the
mixture wth the blood is by no means so
complete as some pretend, For I can readily
distinguish the Chyle from blood on letting it

923.
is out from the large vessels; Then if any
of the other organs happen to be in a diseased
state, where acrid matter is taken up this is
first carried to the lungs before it has a chance
of being excreted. Then it is very evident that
the great quickness of the blood in the lungs is
vastly greater than thro' the rest of the body,
tho' it is by no means so great as it is computed
to be by Dr. Haller. They do not weigh more
than the 30th part of the body, thence velocity
must be greater supposing the division of the
Vessels singular; but the Arteries don't divide
into so many parts in the lungs, and thence
the Velocity is still more increased; and besides
there is a real greater Momentum in the
small Branches of the lungs. Now all
these

924. These circumstances which expose to Diseases
also render the cure more difficult. Besides from
the Spongy & soft texture of the lungs, the Matter
readily passes by corrosion from one Abscess to
another, or even without corrosion by the
communication of the Cells. Besides y^e matter
is thrown up in an unfavorable way, the
opening being at the upper part of the Abscess.
and by making the effort the sides of the Abscess
are prevented from growing together, and are
rather extended. And when Purulent matter
is formed it returns by Sympathetic vessels to y^e
Right side of the Heart, and falls back in the
Lungs before it has the chance of excretion.
We next proceed, following the course of the
Aorta, and Arteries, to consider those of the

The Abdominal Viscera. The course of 925.
the blood in this part of the body is singular.
After the Aorta has supplied the Diaphragm
in the most ordinary way, we find a large
Vessel on the fore part of the Trunk which is
named Celiac, from the Greek word Koilia,
which signifies the Stomach, and the first
branch of the Celiac artery runs on the upper
side of the Stomach in its lesser curvature.
The second Branch runs partly upon the
lesser curvature of the Stomach, and what
remains of it enters the Liver. The Third
Branch supplies the large curvature of the
Stomach on the left side, and with that
the Spleen & Pancreas, as also to the omentum
which is connected to the Stomach. So we
find three principle parts into which this

926. This Artery divides, The Gastric, Hepatic, and
Splenic; then a little lower we find a second
Artery nearly of equal size dispersed upon the
Small intestines & half of the Colon, and in its
course to these conducted by the Mesentery, so
called Mesenteric, and to distinguish it from
a Vein still further down it is called Superior,
or we shall find Three large Arteries dispersed
on the Gastroepiploic Vessels.

The Blood from one Branch of these viz. The
proper Hepatic branch, returns to the Heart
in the common way, terminating in the
Vena Cava, but the Veins which correspond
with all the other Branches join together
to form a large Trunk which enters the
Liver at the place called Porta, and hence
called

called Vena Portarum; then dividing like ⁹²⁴
an Artery thro' the Liver, it spreads into Branches
as small as we find the Arteries do in any
other organ of the body. From the extremities
of the Vena Portarum the blood returns by
Veins which open into the Vena Cava, and
which are called Vena cava hepatica; then
the Vena Cava after receiving these perforates
the Diaphragm, & terminates in the Right
side of the Heart.

Lect. 70th

The Appearance of the Nerves of intestines
is also very different from what we have
often seen elsewhere in the body. We traced
the Eight Pair of Nerves from the Root of the
lungs upon the Oesophagus, and we shall
find

928. And it continued along the Esophagus to the
Stomach; the Stems of the opposite sides joining
and separating again, or forming Placoids,
not Ganglia; Then we see a Placoid sent
on the fore part of the Stomach, & another
on the Back part, so that it is very plentifully
supplied with Stems. But still a considerable
quantity of the 8th Pair formed by the two
sides, runs to the root of the Loele Artery, and
there meets with the great intercostal, or Sym-
-pathetic Stems, and the course of these is
more curious than even that of the Eighth
Pair. They in the Thorax are tied to the
proper Thoracic or Dorsal Stems, and at
the place where they are tied, a Ganglion
is formed, into which we can't trace the course of

929.

of the Stomach & Intestines, from the Throat after
the connection with the Dorsal Nerves. What is
very remarkable we find the manner of its
formation varying almost in every Subject
and there is no such constancy as we would
expect. But about the middle of the Thorax
a number of Branches come off which forms
one Nerve, which runs to the root of the Celiac
Artery, where it is joined to a similar Nerve
of the other side to the 8th Pair, and these three
with other Branches added supply all the
Chylipoetic Viscera; So Haller names this
branch the Nervus Splanchicus, or branch
running to the Bowels. The Throat of the
Nerve is continued down into the Abdomen,
and along the lumbar Vertebrae, joining with

990. The lumbar stives, but sending off branches
connected with the thoracic gland.
Tracing this last it passes behind the ⁴ Diaphragm
then getting into the Abdomen it is enlarged
10 or 12 times its former size, & a knot is formed
like a conglomerate gland, which spreads out, and
we find a web from it covering the ⁴ Colicac
arteries, in which there is an appearance
of threads, but so intermixed that we can't
follow them distinctly. These join with the
8th Pair & form the Colicac Artery, they cover
the whole Arteria Descendens down to its
divisions making a web, and if we did
not trace the nerves into the top of this
web we would suppose it a cellular re-
condensed. Whenever a large artery goes off

off the web accompanies the artery which ^{931.}
serves as a conductor to the tissue. Hence many
Authors use the term of Plexus Celiacus mean-
-ing tricus, superior, inferior &c and pursuing
this Web with the artery it goes to the Diff.
Bowels, & as it comes near to them the Arteries
are better seen.

LECT 7th

We shall now make a few cursory remarks
on what we have seen.

With respect to the Stomach of the Chelypodium we
found Three very principle ones; The Eight
Pair, with the Two Sympathetic Nerves supply
all the Bowels, and the parts of them are
intimately intermixed. On the Lorta, besides
the intermixture of Nerves, there was an
enlargement, for which we can't account; we

932. We find Ganglia, the Nerves swelling out
into knots of a very soft colour and texture,
and in which at least we may venture to
suppose the Nerve Nerves divide minutely, and
before dividing further to the soft organs are
again collected; so that every Nerve seems
a Branch of every Nerve ending in Ganglion.
I already mentioned a reason for sending a
number of Nerves to the Heart, and you see
the necessity of guarding against accidents in
the Elementary canal, that it is of great
consequence as in the Heart itself. Thus
if one Nerve is destroyed it is better that
we lose altogether the power of acting with
a 20th part, which would occasion a fatal
stoppage of the Contract: for the first purpose
of

of the Diaphragm & Abd Muscles is not sufficient
 for procuring the descent of the Treces, but the
 action of the Muscular coat of the gutt is also
 necessary. Next, it is very plain from the
 close adhesion which the Pleurae, or webs
 of Stue forms on the surface of the Arteries,
 that wounds of these arteries will be attended
 with particular danger, or there will be
 more danger from aneurisms forming here
 than in any other Arteries of equal size, who
 are accompanied by Stue running at
 some distance, & in distinct chords. Perhaps
 afterwards we shall find room for making
 further conjectures concerning the Ganglia
 or at least I shall mention the opinion of
 Authors upon that subject.

Next,

934. Next, let us attend to the course of the blood, wh^{ch}
in this part of the body is quite singular. We
have seen three principle Vessels, the Ægeliae
and the Superior & Inferior Mesenteric arteries,
sent off from the fore part of the Aorta. One
Branch from the Ægeliae runs into the Liver,
and the blood from its extremities is returned
again in the common way to the Cavae by the
Vena Cave hepatica, wh^{ch} corresponds with the
Hepatic Artery as well as with the Vessel
called Vena Portarum. But all the other
branches of these Arteries make a much longer
course before they reach the Heart, or being
found that the veins of the Stomach, of the whole
trunk of the great & small intestines, with their con-
=necting membranes, and those likewise
of the Intestines, Spleen & Pancreas, instead of

of going back to the Cava, join together to 995.
from the Vena Portarum, and immediately
after this it divides, first, into two principle
parts, and is then further subdivided thro' the
whole mass of the Liver in the manner of
an Artery. Not when we inspect it, even in this
part of its course it has the appearance of a
Vein, and we cannot demonstrate a circular
Muscular Coat, but it divides into branches
as small as those of the Arteries in other
places. May it is easier to push an injection
from the Artery of the Spleen into its corresponding
Vein, than from the Vena Portarum into the
Vena Hepatica. Thus the blood from the
ends of the Porta is conducted by 4 or 5 vena hepaticae
hepaticae into the Cava, & so to the Heart.
It is difficult to define exactly the powers by which the

936. The blood in this course is pushed forward, I take
for granted that the Vis a tergo operates considerably, &
I formerly took occasion to observe that the impulse
of the Heart is by no means so soon lost as many
Authors conceive, and that in moribund animals
as in Frogs, I have reckoned the strokes of y^e Heart
by looking to a Vein, tracing the Artery with a
Microscope till it turns back into the Vein, when
the Animal turns languid, we see the blood at each
stroke of the Heart move forward, tho' in health
the motion appears uniform throughout, so we see
that Vis a tergo contributes. But next, tho' I cannot
demonstrate an Arterious coat, yet as the Veins
possess a contractile power as well as the Arteries
in other places, I take it for granted that there is
the same thing here, that the Vibrations of
the Vena Portarum promote the Flow, as the
ultimate branches do elsewhere. Still however
there

997.

There is a great Difficulty in the motion, and so
We understand why We are more subject to
Diseases in the Hypochondriac Viscera, or in the
Chylific part, than in the other parts of the
body. And particularly we see the reason why
Sedentary People are remarkably subject to such
Diseases. For the Muscles of the belly, exert very
considerably the power, the Veins are provided with
Valves, & every stroke of a Muscle empties y^e Vein
between the Valves, & what was in it is pushed
on with Violence. So the Circulation is much
quickened by motion, & the Veins in the Belly
especially need that motion to promote y^e expulsion
of its contents. In a certain Degree they are
constantly assisted by the necessity of respiration
alternately, but somewhat more is necessary
to keep our body in a healthy state. Now, as y^e
Resistance to the return of the blood is greater thro'

908. Now two Systems than, Moreover, if there is a general
Disposition to Dropsy, whether from a relaxation of
the Solids, or Menstrues of the Blood, or from both,
It is very apt to appear in the System of the Vena
Portarum, so that the Ascites or Dropsy of the
Peritoneum is more common than that of any
other sheet sac.

Next, if it shall happen that the Liver is any way
Diseas'd, we see that the whole Symploastic viscera
come to suffer in consequence of it; or that a Schirrus
in the Liver in a great degree acts like a ligature
on a principal vein elsewhere, the exhalation is
encreas'd, without supposing that Branches of
the Red Veins abort, the exhalant Branches throw
out their liquors in great quantity, and if the
Schirrus Liver compresses the bottom of the
Thoracic Duct, then a double cause occurs, less
being at the same time absorbed. Now

Now, next let us trace the blood thro' each of these ^{organs}
organs, & see what is proper to them, & their use;
and following the order of the Demonstration, We
attend to the Vessels of the Elementary canal.

We have seen this in its whole tract joined together
by very beautiful arches; larger anastomosis were
found here than in any part of the body w^h was
before examined. And we readily account for this
that it is to guard against the danger of obstruction
in organs subject to unequal degrees of Distension
& which readily change their place, that though
one organ is compressed, the blood may flow freely
into its extremities. Perhaps there may be somewhat
more than this, for in various Arteries of our body
we find Siphonine turns made on purpose,
as in the Brain; & we see an evident reason for
this in the Brain, That the Momentum of the

940. The blood is broke. Here we may suppose that
the Vessels give a preparation to the liquors, which
are afterwards intended to be deposited in the
cavity of the Canal, or for further purposes of use.
So with respect to the Spinal Chord in Quadrupeds
the Artery is much longer than appears necessary,
In a Bull it is upwards of 20 Feet in length, and
we cannot suppose that this is in vain; Therefore
it is highly probable that the various Arches in
the Menstrary serve further purposes than of
mere guarding against obstruction, and what we
alledge of the Arteries may be applied to the
Veins. Tracing the Vessels to the coats of the
several Bowels, the Anastomoses are repeated
in a Thousand places, & more especially in
the Stomach where they are larger than on
the

The small intestines, that Organ being more
 than any other Subject to Unequal Distension
 and more in Danger of Obstructions. Tracing
 the Vessels thro' the coats, the number of Branches
 increase greatly, & at length a very minute Divi-
 -sion is made on the outer side, & still a further
 Division on the inner side of the villous coat, &
 the Nervous coat connecting the Muscular to the
 Villous, which we would suppose serves by its
 several Threads to conduct these Vessels with
 safety, & prevent them from being tore, while the
 Threads likewise support the Rings or Valves
 within the Intestines. Now, whether we Judge
 from this experiment, or from the same proceeds
 the Liquors within our Veins & canals pass,
 we may suppose a regular organization, &
 not merely a purpose thro' pores, or that Con-

942. considerable changes are at the same time oper-
ing in the separation. The contents of the Stomach
possess very particular qualities; Dr. Young has
thrown a good deal of light on this subject,
We found that the contents of the stomach of
a Roebuck, & even of those animals which never
taste milk, as in Birds, Curdles Milk & produces
a remarkable change; and that in consequence
of any acidity, and it were easy to show that if
liquors in our Elementary canal dissolve our
food. So these properties must be acquired by
a regular organization; and here we seem to
see That, after making a good injection, more
than in other places.

Now, after giving thus far of the parts in a
sound state, I shall make a few remarks on
the causes of Diseases, or on the state of the
parts

943.

parts labouring under them, and we shall
begin with the most simple cases, or those which
are the most evident, or admit of the most easy
explanations.

I show you a great number of concretions passed
by stool, or the Cause of Death, and taken from
the body after it, forming in diff^t parts of the
Alimentary canal; and to enable us somewhat
to explain the formations of these, I have added
some Balls from the Monachs of Cows, and which
are evidently composed of Hairs, which are always
of the same colour with those on the Surface;
So we cannot doubt that they are gathered by
the Animal in licking itself; and from the
Direction of the Papillae of the Tongue they are
carried back with their food and collected in
the Monach. And the Monach of this Animal

944. possess a very great power of contraction & of
Varying that in a variety of ways. Now this
enables us in some measure, tho' not fully, to
explain the Concretions in the Human body. First,
We would suppose that from a defect in our
Digestive powers the food was not suffy dissolved,
and the fibrous part therefore of it collected, so
as to form Balls, which is probable. & when we
draw out the parts of these Balls, the texture
resembles that of a Hart, there are very small
fibres which have some length, composing the
diff. lamellae. But perhaps tho' We allow this
to be one way in which these balls form, yet it
is not the principle, there is another circumstance
a kind of power which we call attraction,
(for want of understanding it fully) by which
one part adheres to another. To if a Person has

945.
has the misfortune of being wounded in y^e
Bladder, & a ball lodged there, a stone will form
upon it; In like manner there is an attraction
to the seed within the Uterus & Canal of the
part of our food. And in proof of that, almost
every one of these balls is found to have in
its centre, as a nucleus, some solid body, the
most common is the Stones of fruit; in some
there are bits of bone, in one which I have
a piece of wood, in another as so like lime,
and in others a dark coloured ss, which was
probably at first a clott of blood. We recollect
what I formerly show'd, the Stones of Goosebones
incrust'd, which occasion'd very troublesome
Symptoms, I directed the Patient to observe if any
were pass'd, and between three & four thousand
of these seeds were collected, and yet y^e Patient had

946. had not tasted Gooseberries for a month before;
Now had any one of them remained it might
have formed a ball. So there is an Attraction with
the Nucleus to the food, & in consequence of
this sort of the balls have a strong crust, some
resemble the concretions which form in the
Salivary Ducts, others have an oily smooth one,
others again have thin layers resembling the
Pericary Calculi, so that the Nuclei is attracted
by these balls. Now after they form they may
stop in any part of the intestines, but they will
most readily do so in the Caput caeci & coli, and
more have been found in that place than
in any other, as they may remain there
out of the passage of the feces.

To discover these kind of balls with certainty will
often be impossible, but in other cases we discover
them

947.
them certainly. In gen^l they produce a great
deal of pain from their Bulk & hardness, and the
irritation they occasion from the Absorption they
make in the descent of the Uterus, the Pelley is
very unequal, & the pains go & come in the most
irregular manner, & if the Patients do not from
their constitution or habit appear to be subject to
Spasmodic complaints, or to have a remarkable Weak
Stomach. But the only sure method of knowing
them is, by the feel with the hand, and by a feel of
the place, or change of place they undergo. In some
cases we can plainly discover the Ball, by its
hardness & shape, especially if the Patient has
long laboured under the Disease, which may
continue for a number of years; In one case
it had continued seven, and the Patient had
undergone a variety of Medicines for a number
of

9th. of the Spleen; Now in that very case I could
discover the Ball by its hardness and shape,
then attending to the change of situation, I found
that the Ball shifted from one place to another,
and this change of place was attended with pain.
Now, suppose that we know the complaint, with
an high degree of probability, we promote the
Descent by Purgatives or Oily medicines, given
both by the Mouth & by injections, if the ball
is within their reach. In this case I followed
the Ball from the Region of the Spleen upon
the Left side, down into the groin, then across
to near the middle of the body, so that I was
persuaded that it had stuck about the Sigmoid
flexure of the Colon. Now, suppose next that
the Purgatives have no effect in moving the
Ball, & that at length it totally stops, & passage of

of the Stones. Here I apprehend there is room ^{950.}
for proposing an Operation, especially in certain
situations of the Ball. So a cut can be made
into the Cavum Coli without going into the Cavity
of the Abdomen; Or if the Ball stops on the left
side, there is the same encouragement to make
the incision. But suppose next that the Concretion
is lodged in a loose turn of the Bowel, or in the
sigmoid flexure of the Colon, even in that case
we might be able to take out the stone without
any great risque, because the stone when it
remains long in any one place with pain,
occasions a contraction of the parts, so that the
turns of the Bowels are fix'd to the Ritons or
Scurvy. So we can make an incision without opening
the Cavity of the Abdomen. In one case I
advised

95th. a Divisⁿ of this to be done, but the symptoms came
on so rapidly, that it was not attempted, but an
adhesion was found, & the concretions might have
been taken out. But before we would do this
operation fully, We might make a slight cut
with a lancet into the teguments & Muscles,
and with a small instrument like a common
needle, & formed like a screw might make a
small hole in order to determine the Nature
of the humour, & if We can ascertain that, We
may proceed to finish the operation.

Let us next attend to the Diseases occasioned
by the different Worms, which are formed
in our Intestines. I shew'd You a Glass
full of Solids like those in the Pericæ, which
is only the young Worms adhering together by
the Amacula, that they cluster together as many

many Worms do. But on injecting them ^{into}
at the mouth of one Joint, it passes in very
curious vessels from one Joint to another, so that
the whole is one Animal; at the same time
every single Joint makes an animal which
is capable of living separately, but they live
best where they are all connected, when tho
some joints do not receive it, from the Joints
placed elsewhere. It has been disputed most
whether the Animal has any head, or if there
is any single Joint which serves for it. Now,
Lysen & Munk show that it has a head, or
Innoculum, by which one end adheres to
our Testicles. But further, the best Naturalists
take it for granted that the Animal possesses
a power of regenerating its Joints. Now there

¶2. Now, there is no ground for such a supposition,
If it were to grow in that manner, by Detaching
a certain part, we do but little service, like the
Hydra, it will grow again; and there is no
experiment to counterbalance that, except that
the joints communicate, so will find that
in Different species of that Animal there is
a certain number of original parts, but that
it may live tho' many of these are taken
away.

The Head and the Round Worm, is Different
from the Earth Worm, nor do I know that
either the Terria, or Round Worm have been
found but in living Animals. Andrus
gives us a story about a Well where a
Terria was found, but it is very odd that
we

We have only one vague observation of this sort. Now these animals get into the Intestines is a difficult question indeed, but they seem only to Live There; Now this sound Noom is much more dangerous than the Trinia, as it preys on our intestines, & often kills by Corroding them; the villous coat especially is preyed on, but they have power, & force enough to destroy all the coats.

The Third kind or Ascarides is considered as a distinct species, but Mr. Isather suppose that it is, I have a suspicion that the Ascarides are the young Dumbricæ, because they agree in shape very nearly, & they may at least exist together, as Dr. Patients who pass numbers of Ascarides now and then pass a Dumbricæ.

Now in all these kinds a notion prevails that

954. That we can kill them by stopping their
breathing Pores with oil; so if you dip the body
of a fly into oil you kill it instantly. but none
of these Worms breath, and I have seen them
alive swimming in oil, which had been
Microscop in our purpose and passed again.
So our attention ought to be directed to other
Remedies. I have tried Time Water, which is
very destructive to these Animals, & our Stomach
& Bowels can receive it, therefore more is to
be expected from it than from oil. There are
however other insects which Infect us, and who
have breathing pores, and for the killing of
those Oil is an effectual and safe remedy.

Lect. 72

Next, you all know that the Insects
more especially are often Mechanically aff^d in

in Hernia, but these I will have occasion to ^{953.}
explain fully afterwards, when treating of the
operations proper in that Disease. Even where
the Bowels remain within the Cavity of the
Abdomen, they may suffer in a similar way.
If we find that the Omentum in cases of Hernia
is sometimes dragged very low down with the
Bowels, & by being twisted around them
strangles the gut, not only prevents the feces
from passing, but the circulation of the blood,
& occasioning a Mortification, it is possible
that the turns of the Intestine may be entangled
by the Omentum within the Belly, particularly
if it has been enlarged by a Hernia, & then
returned; or if the containing parts have been
very much stretched, as by Water contained, or
from the Bowels being distended by Wind, for

956. for after the Bowels subside, the parts are loose,
and the Muscles shrink & easily, and allow
them to shift their place. Now, in one, I was
surprised to find a doubling of the Intestinum
Therm compressed by the Appendix Vermiformis
passed around; the end of the Appendix was very
considerably swelled up, & the doubling of the ileum
included was upwards of a foot in length,
and the case was attended with all the
Symptoms of Ileac passion; see an acct of it in
the 1st Volume of the Physical Essays.

Besides, the Intestines from causes which it is not
very easy to explain, change their situation,
so as to render the passage of the food thro' them
difficult. Here I shew you a case where the
lower part of the Colon on the right side seems
to have been just enlarged, then twisted,

so as to touch the Gall bladder on its left ⁹³⁷
side; and the Cæcus coli thrusting round
made a pressure on the Colon, and hindered
the feculent matter to pass on, nor did this
happen after Death, as there was an universal
adhesion of parts.

Next, You have seen the Disease which is called
Intus-susception, where one part of the Intestine
falls within another, or one part is pushed
double within another. Now we can explain
several ways in which this complaint may
happen. There is a continual spasmotic
and cramp spasmotic motion in the Canal,
and the contraction of the circular fibres is such
that they can bring the opposite sides of the
Intestine to touch; and we need no other
proof of this, than that Mercury passes from the
the

958. The stomach Downwards. So that if a part
is strongly contracted in consequence of irritation,
the contracted portion may pass within that
named beneath it. And if we visit the
Intestines of a living animal, we can see
this disease produced in a certain degree.
Now, as I formerly attempted to prove that the
Antiperistaltic motion is as Natural to us, as
the Peristaltic, we conceive that there may be
an intus-susception upwards as well as downwards,
tho' this will not be so frequent as the other,
For the food ascends by its weight, & the Peristaltic
motion is more considerable than the other.
Now we would suppose the disease most
frequent where the Intestines are loosest,
but we must add another circumstance,
viz. The constance of the faeces; as the
most

most fluid excrement will more readily 959.
pass thro', and hence the weight of the contents
will not be so apt to produce the Disease, or
compressing two portions together, the middle of a
small & of the great gutt, the Index description at
the middle of the colon, or the great arch is more
common than that of the small intestines, &
where it happens the Intestine is carried
much further, but the complaint will still
be more frequent, if a moveable part enters
into one that is fixed in its place, for a fixed
part not yielding the other enters freely in.
So in children a Prolapsus Ani frequently
occurs, which is just an index description.
Now, from the effect this Disease must have
upon the motion into the intestine it is
quite

960. quite with that the circulation of the blood
must also be rendered more difficult, and the
Vessels are bent in the part that enters, so it
may produce not only immediate danger,
but lay the foundation of other complaints.
So I showed you several pieces of the Intestine of a
child, where an intus-susception had taken
place, but without adhesions, yet the Gut was
strengthened in that place, & the coats at the
same time altered in their colour. Now if
Disease being understood, are we to expect
much relief from a practice which has been
recommended 1000. The giving large quantities
of Sweet-spirits, or any other spendorous ss, in
order to disengage the Parts? I apprehend
there is little room for expecting much from
this practice; For the Mucus is divided into

961.

in some parts in the whole tract of the Intestines;
But supposing it to reach the diseased part, it can
only be of use where the Disease is from below
upwards, which is less frequent than the other.
Perhaps more is to be expected from a practice which
has been of late revived by De Haen, the throwing
in Oil, as Air or Water by the Anus. These
by stretching the Bowels, if no conversion be yet
found may disengage the tumors, but must pursue
the Experiment with caution if the Disease is
placed higher than the valve of the Colon, for
when the Bowels are much irritated, we may
not be able to overcome the valve, & may hurt
the Intestine. I must show you a piece of
Intestine with all its coats, and even a
portion of the Membrane discharged by stool,
and yet the faeces continued to be passed in the

962. The common way for six months afterwards,
and the Man Died of a fever without any complaint
of the Ulcer & Canal. Now, the explanation is easy
after understanding the situation of the Intest-
Suaphes; We can conceive that this was in
the form of an inter-suaphes, then just where
one portion entered the other, there was a Morbidity,
that a difficult circulation took place from the
Twisting of the Gut, then the part Morbified, so
the canal you know was contracted, & may
the passage for the Issues would be made easier.
Next, a Constriction of the Gut is may begin from
an Intersuaphes, which I know to be a great
cause of Death. In 8 or 10 Diff. Persons I have
found a constriction of this sort, where there
was not room to pass more than a quill, & no

963.
thro' the canal, & where the gut above was
distended to a prodigious size, as in the case of
the late Duke of Douglass where the whole
arch of the colon was distended, and a rupture
of the colon. I do not mean by this to assign
intus-susception as the sole cause of these
contractions, they may depend on a variety
of causes, and we see examples of contractions
from the Mouth Downward, the whole way
thro' the Oesophagus at the Pylorus &c. Now
we may often form some judgement of the
place, & if it is near to the upper or lower
end, there is room for the operation. Thus
suppose there is a contraction near the
top of the Oesophagus, instruments may be
introduced, or if it is near to the Pylorus
and

964. And, & the Surgeon is called in time, by sponge
And & a Dilatation may be made & stay
where the Disease is higher and the Colon, it is
of use to know the place, as we may give
Relief by liquifying the Faeces, & promoting
Discharge by injections. In one case of this
kind I found that the bowels could only
contain 3 lib of Water, & no more without
giving pain, whereas I know we may
for ordinary is ~~double~~ double, & sometimes
triple that quantity without meeting
with resistance: and after the Patient's
Death I found a contraction on the Left
side of the Colon near the Spleen. Now all
this means not mention, & mechanically
stop the intestines, & therefore may occasion
an

an inversion of their motion, and a ^{globy}
vomiting of the Gall. Some have supposed
That where faces have been vomited, a whole
alum. canal was full up to the stomach,
and yet the matter itself put on that apper,
but independent of this a real inversion of
the motion can take place. I knew one
Patient who vomited Glob of feculent matter,
such as is found in the Colon itself, I attended
carefully to the appearance, and found a
great deal of feculent matter below, but
near to the stomach the Intestine was
in a great measure empty, & there was
no constriction about the Pylorus.

Next, I would allege That without a mechanical
stoppage, all the symptoms of Hæm may be produced
partly the inverted motion. In two or three cases an

globe an inflamⁿ in a particular part of the intestines
put a stop to the descent of the Faeces, and yet I
know that every inflamⁿ does not affect the gutts
in that manner, We often find the whole or a
great part irritated without seeing this inversion
produced. Thus We find inflamⁿ in a certain degree
followed by erosion taking place in Dysentary, and
yet there often is no very great degree of sickness, and
scarcely vomiting produced, and no appearance
of inversion. Nay, where the whole tract has been
found in an Inflamed state, so as to occasion the
adhesion of one turn to another, and after that a
thickening of the coats, & an erosion produced in
the adhering coats, so that the Colon communicates
with the distal parts of the Canal, even here there
was little vomiting and no inversion. But
all the appearances of Dysentary may be supposed
to be preceded by some degree of Inflamⁿ. Some have

have eroded in describing a Marky kind of an ^{gley}
appearance like the small Pox when they are
beginning to thrive, as the only effect of Dysentery;
for in several cases we find Manifest examples of the
Erosion of the Villous coat to a considerable extent, and
I have even found the Muscular coat eroded
very considerably.

It may be worth while to observe further with respect
to this Inflaming Disposition of the whole canal, that
this complaint is very common in Children, and has
been very generally mistaken by Physicians, who have
supposed that the Mesenteric Glands were of chief
seat of the Disease, that these are affected so that
the food is not received in due quantity, & hence
the Degree of Marasmus that attends, then a Dis-
tension is observed, which is supposed to be owing
to the food remaining in the Canal till a
Degree

968. Degree of Putrefaction comes on, when a separation
of air takes place, or the guts are relaxed, & yield
to the distension by the air. So this complaint is
traited by rubbing the part, & giving the strength
remedies, as the Back & Steele. Now when the
affection is in the Mesenteric glands, I do not
find fault with the common practice, but there is
a real distinction to be made, tho' the general
appearances at first sight are the same. First
In the affection of the Mesenteric glands there is a
distension which can be handled without pain,
but in the other case there is a great degree of
pain on handling, so that few are able to
bear a stroke on the Belly, which sounds like
a Drum, so that we readily distinguish this
disease from a collection of water; Then they
bend the body greatly forward in order to relax
the

the parts as much as possibly they can, and
the Pulse is not only quick but hard, and the
treating in the Antiphlogistic method, as far as the
weakness of the Child will allow I find answers
best, so the Warm Bath, the most cooling kind
of Diet &c. may be the most proper means of
preventing things from coming to extremes.

Now, next to the purple we see marks of erosion in
the Dysentery, Gen many other Diseases; You all
know that our common English name is the
Bloody flux, Now where that Discharge is very
considerable, We are not to conceive that the
Blood is pour'd from the extremities of very small
Vessels, but that there is an erosion of considerable
portions of the Villous coat, & that the Blood
comes immixed from the eroded Vessels, as is
evident from its quantity & Colour. Where it

970. it issues very slowly. We find an appearance
like the grounds of Coffee, which has been called
Black Bile, improperly, tho' there may be an
affection which Hippocrates meant by that name.
So after Lithotomy, I attended a Patient who was
sick'd with a violent Vomiting, & Discharged 4 or
5 lib of matter like Urine in the bottle fish, I
show'd it to Dr Black, & We could not determine
whether it was black blood or not, I never saw
an appearance so like the Uratilis as this.
Sometimes the quantity of blood is such as to
fill the whole intestine, and to take on its
shape, & by degrees the red colour is lost, the
Coagulable part of the blood only remaining;
hence we find descriptions of Monstrous Animals
Kinds of Worms, which were produced in that
very manner. Instead of such large erosions
You

946.
You imagine the bowels (as is often the case)
very much irritated, then we find an appearance
of Membranes discharged by stool, which have
been taken for the Villous coat of the intestines,
but it is produced by the Mucous of the Guts,
and under this some small quantities of blood
are diffused, which gives the appearance of an
organization. Now, if I can demonstrate that
large portions of the Villous, Nervous & sometimes
of the Muscular coats are destroyed in Dysentery;
Why should I doubt that Ulcers are formed in
consequence of it? If the Patients to whom these
preparations belonged, had survived a few
weeks, every hole would have discharged a
Purulent matter. So we may conceive Ulcers
to follow Dysentery not infrequently, and
should adapt our cure accordingly. In some
cases

972. cases the erosion extend a considerable way.
so I show you the whole coat of the arch of the
Colon corroded, and an opening made into the
cavity of the Peritonaeum, and that there was
no matter appears from the operation we had
recourse to in order to give relief; The Patient
after Dysentery was seized suddenly with a
great swelling of the Belly, distending the
Abdominal muscles very much, and the
Diaphragm was thrust up into the Thorax,
so that the Skin of the Abdomen was smooth,
and from the stretching of a red colour, and on
striking, it sounded like a Drum. At first
there was a suspicion of the Distension of the
Intestines from wine, but in giving a Purgative
(which went tolerably well thro') no considerable
quantity of air was passed. So I was confirmed
that

That the coats of the intestines were eroded, 979.
and that the air had got into the cavity of the
Peritoneum, & could not return, the membranes
being squeezed together so as to have the effect
of a Valve: So I had a puncture made, as I
thought perhaps the opening from the Gut
was small, & might in time grow together, &
that there was a possibility of the Person recovering,
and there was an immense blast of Wind
Issued from the Abdomen, in so much that
a candle was put out, & lighted again by it.
However, in a few days the swelling began
again, and the Patient died in 10 days after
the operation, when we found such an erosion
in the middle of the Arch of the Colon as I
now show You.

Next,

9th. And, as we see erosions, and the possibility of
Ulcers forming from other causes, For Ulcers
in the blind Canal, are by no means scarce,
I have often seen, where I have found Ulcers
with fungous edges, and one there was evidently
a cancerous appearance, or spongy flesh from
which a considerable quantity of blood poured
out. Now, if in the case of cancerous Ulcer
or of any other kind where the matter is acid,
there is an Absorption; You will imagine
that the Mesenteric glands will be affected,
as Abscesses are produced in several cases;
1. I have seen these glands considerably swollen,
as where there was an erosion of the Gutts
from Worms, where I suppose cancerous matter
had occasioned the swelling; it might
happen

happen without it; but they more readily ^{9th}
swell in the case of an Erosion, than where
the complaint proceeds from a diff^t cause.

Lect. 78 &

• We next proceed to consider the structure, and
some of the affections discoverable by Dissection, of y^e
opposing *Chylific Viscera*; and we begin with
The Omentum. I shew'd You the structure
of that organ formerly by Dissection in the recent
subject, and I observ'd that there was no room
for consid^rg it as serving to keep the intestines warm,
because it covers only part of them; and that its
evident purpose was to supply a quantity of
fat only matter to lubricate their surface.

Are we now to add further Uses? Are We with
Moorhouse Haller & their followers that it is
intended primarily by Nature to furnish
oil

976. Oil to the Liver, and to assist in y^e formation
of the Bile; I apprehend not, because tho' the
Veins take this course, yet the Lymphatic
Vessels terminate with the others in y^e Thoracic
Vessels, and as the Absorption is performed by these
the oil must pass first to the Heart.

With regard to the Diseases of it, there is little
more to be offered than what may be done
concerning the Fat under the Skin & elsewhere
in the body. It is subject to Steatoma, which from
its size affecting the whole, may disturb, or
interrupt the functions of the chylific
Viscera; whilst at other times we find the
Disease appearing in small portions of the
organ only, of which I have observed several instances
in Life. I have distinguished lumps of conside-
rable size, which could be made to float on the
surface

surface of the Anterior. It is very where 977.
supplied with small branches of blood vessels
so that Surgeons may use freedom in making
incisions into it, without tearing up large portions
of it as is usually done, and it is much safer
to cut a long portion of it from the under edge,
than a small one where it tears to a great depth.

Let us next turn our Attention to the Gland of
The Pancreas. Which is stretched transversely
across the Body from the Spleen to the Duodenum,
with a duct in the middle which opens into the
Duodenum at the same place where the Biliary
ducts do. I formerly mentioned the resemblance
which this gland bears to the Salivary gland
placed about the mouth, They have the same
kind of colour, a similar division into lobes,
and its coats are transparent, like those of

97th of the Inferior Maxillary, partly those of the
Parotid gland being thicker, as being exposed
to more pressure, the Arteries too are disposed
thro' it in a similar way, and De Graaf who
collected some of the liquor of the Pancreas, found
it to resemble the Saliva; and where it is
Dilated by Concretions or Schisms, the appearance
of the Concretions & swelling of this gland correspond
with what We observe in the Salivary glands;
May we may observe further the Determination
which Mercury has to both, at least I suspect
the Diarrhoea which often attends the giving
of Mercury in large quantity may be in some
measure considered as an increase or Flow of
the liquor to the Pancreas. With respect to
the more indurated structure of this Organ
shall be considered afterwards, when We are

are comparing the Salivary glands together;
So I would only remark further here, that we
have no Data which can enable us to explain
the effect of Mercury upon this gland; it does not
find a ductus by the straight Branches, & they
heavier bodies, which keep the middle of the
River, while the lighter are thrown to aside, as
its current runs at right angles. Besides supposing
this, How are we to account for the Secretion
of the Saliva, which is a lighter substance? We
must explain the operation of Mercury therefore
upon Salivary Principles; and whenever we
shall be able to explain why the Salivary gland
separate the Saliva rather than Urine, we may
attempt to explain why the Salivary gland in a
particular manner have the Mercury determined
to them; and this must depend upon the

980 The intimate Division of the Vessels, and the
part^l feeling of the Vessels which in a great
measure escape us. The next organ is the
Spleen. You have seen the artery which is of
considerable size. It in its course supplies the
Pancreas, gives Branches to the Stomach, and
enters the Concave part of the Spleen, and in the
ordinary manner Divides into a vast number
of Minute branches, which escape the Eye.

From the extremities of these, the blood returns
in the common way into the Vein, for it is a
mistake to imagine that there are Cells
intervening, we only produce the Cellular
appearance by pushing an injection with
violence, and the appearance is the same
whether we throw the injection into the Artery
or Vein, provided the force is so great as to burst

981.

Must either, so the Cells are portions of the
common Celer is lying together the very loose
and tender vessels of the Organ, but there is
no reason to presume that blood is extruded
into Cells, or into the common Celer so. The
Spleenic Vein forms a Branch of the Vena
Portarum, joins with the Inferior Mesenteric
Vein, then the Superior Mesenteric & Gastric Veins
are added, and except the Vein & the common
Lymphatic vessels, which are by no means either
unusual in Number or size. We do not find
Hollow tubes coming out of the Spleen, & therefore
You would at first sight suppose that we must
be under a difficulty in explaining its use, or
that we are obliged to speak rather from Con-
jecture than with certainty. Or if you want
any clear proof of our being still in the dark,
look

982. Look into the very laudable Work of Haller, & you
will find a vast variety of opinions proposed,
Proving that the uncertainty of all of them are
such as do not merit repetition. I wish I could
except from this general character of opinions about
the use of the Spleen, a late one, but I find no
room for doing so. I mean that of the late ingenious
Mr. Keegan, who imagined he had discovered its
use, and who has very properly directed our atten-
-tion to further experiments to be made on that
organ. But from this experiment so far as I
know them, I see no just ground for adopting
his opinion, which is, In the red particles of
our blood there is a dark central part, & there
is a surrounding as which he calls a Neucle,
Now he imagines that these Neuclei are added
to the central parts of the blood, or that the
form =

formation of the Red Globules is completed 983.
in the Spleen. The only reason he gives for this
is, That in the Lymphatics coming out of it, this
Vessel is seen, i.e. The red particle complete in
all its parts is seen. Now, surely it is no argument
that the Spleen forms the blood, That a great deal
of blood is circulated thro' it, for That, when it
enters is formed already. Next, I could not admit
That this appearance is constant in Lymphatic
Vessels; We would induce us to believe That
we find constantly those particles passing thro'
the Spleen; but I knew That the Red Lymph
is not more proper to the Spleen than to any other
part of the body, That the Lymphatic Vessels of the
Spleen convey Red Globules is beyond Doubt, &c.
Whenever by an incision into the Abdomen
the

984. The part has been exposed to the air, or the Neigh-
-bourhood of it has been considerably heated, and is
in an Inflamed state, & therefore particles are to
be seen in every Lymphatic vessel of every Organ
that is so exposed. And therefore we may take
any idea we choose about the formation of
these Globules, we may suppose the Spleen, and
another the Liver &c. It is not necessary to say
at present in what manner these get in, for
I formerly spoke on this head, but tho' I had not,
it is in no way material, for every Organ and
its Lymphatic Vessels, are full of particles when it is in
a state of Inflammⁿ, and the Thoracic Duct, after
large wounds of the Abdomen will be found
filled with blood, & every other property.
But further, To show that Nature has more
in

in view than the formation of vesicles, and to ^{985.}
return to the opinion which has long been
entertained in a general way, & in which authors
only fail in descending to particulars. Do we not
find the whole blood going to the Vena Portarum?
If the Spleen was destined for the formation of
the red particles, why is not the blood returned
to the Heart more shortly by the Vena Cava?
Is it not evident that as it passes into the Vena
Portarum, that this, thro' the Spleen receives a
somewhat that is useful, and which fits it for
the separation of the Bile; and thus far we may
go and no further, because a sufficient number
of experiments have not yet been made. I
have seen several instances of diseased Spleen
and have examined the Liver, but yet changed
upon

986. upon the Liver, or Bile are not very distinguishable
and the consistence of the Bile in the Liver, and
that in the Gall bladder vary, and with the
consistence the colour is different in different
Persons. So without a vast quantity of Expts
Our conclusions must be very uncertain.
When the Spleen is diseased, the size can be
very much increased, without any great change
in its appearance, In some cases it is softer
and this are plain marks of an Effusion of
the Blood, in other cases the whole Mass
seems to have partaken of the Disease, and
the consistence is greater than in Health, but
there is no other sensible change.

The Liver, Its seat is, from the connection
of the Gall bladder you already know, is to

to separate the Bile, which again serves 987.
for the purpose of Digestion. It appears in the
first place to unite the coats of the Alim⁹ Canal,
and to excite them to their proper contractions;
since from the flow of Bile being interrupted,
Patients are very easily costive: Besides it assists
in Dissolving & decomposing the fermentation
of the Aliment in ways which are by no
means thoroughly understood, and which I shall
have occasion to consider further afterwards.

The secretion of the Bile, we would suppose at
first sight chiefly performed by the Hepatic Portation
as Authors have imagined; This appears from the
size of the Hepatic duct compared with the Hepatic
Arteries, for these are too small for the purpose.
Now, we find the blood carried in a most
unusual manner into the Liver by the liver veins,

988. Veins, and the Kinde these form performing
the office of an Artery, which surely is not in vain,
and no other material purpose occurs, but the
preparing the blood better for the use of the Vile.
To these considerations we may add an Experiment
which several have made viz. The throwing
Injections into the Vena Portarum, & finding
that these very readily go into the Bilious Ducts;
viz. that a certain colouring Powder, as Vermillion,
can be made to describe the course, and when
we throw the Liquor backwards from the Bilious
Ducts, it more readily finds its way into the
Vena Portarum, than into the Hepatic Artery;
and the only question is whether a portion of it
be derived from the Hepatic Artery? Now I do
suspect that it concurs in separating the Bile,
and two Arguments lead to this supposition, for

For when I pursue the Branches of 4th Hepatic 289.
Artery which enter the Liver, I find that they go
Directly into the Vena Cava, that they have the
same communication with the Vena Portarum; Now
if some additions were not made, we might
have conjectured that the Branches of 4th Hepatic
Artery spent on the Liver, and have assisted in
forming the Vena Portarum, Why might not
they do so as well as the Splenic Artery? Further,
when I have injected into the Hepatic Artery
I have observed that the liquor got into 4th Branch
Directly, without evidently getting into the Vena
Cava hepatica; so that there is a communication
with the Vena Portarum freely. But I would
wish to repeat these experiments and it is difficult
to judge certainly on account of the interference
of

990. Meminal Branches. Authors however have
imagined that this is by no means a Purpose
of the Nephritic Artery, and have confind its Use
solely to the Nutrition of the Liver. Now tho' it
may be probable that it does serve this Use, yet
you will not find a clear proof of this opinion.
Now do we know that the Vena Portarum does
not nourish the Liver as well as the Bowels
and Spleen? So Perhaps there is a circumstance
further in view different from Nutrition; that
an Office is performed by blood that has immedy
pass'd the Lungs, which can't be performed if
it has undergone a circulation elsewhere, as
in the case of the Branches of Vessels.
Let us next suppose that the Bile is secreted
by the Vena Portarum, and perhaps that of
Nephritic

Hepatic Duct opens in a small Duct, the ^{991.}
Blood remaining after the secretion passes on to
the Liver &c, while the Bile is conveyed down
by the Hepatic Duct, which joins with the Duct
of the Gall Bladder; so the next point to be deter-
-mined is, do we find two Ducts forming a
Ductus communis, or do we imagine that the
Bile of the Gall Bladder comes entirely from
the Liver? Or with Albinus are we to think
that the coats of the Gall Bladder separate that
which it contains? I apprehend the common
opinion is the first one, and that Albinus's is
to be altogether rejected. He was led into this
notion by observing on the inner side of the
Gall Bladder, a number of little Poles, or
Tollies, which seem'd to have no other use
but.

992. But to separate Bile in it. But these are still
larger in the course of the Biliary duct, & partly
in the Ductus Communis choledeus, and I
have given a clear liquor off from Bile,
filtering them, so that this use is to separate
a time to defend the Bladder against the
ceremony of the Bile, of a similar nature to
that which is separated in the Humor of the lungs.
But Albinus did not rest singly upon this
operation, or upon that of the greater ceremony
of the Bile in the Gall Bladder; But he found
that in Birds there was a vast difference
between the Bile in the Gall Bladder, and
in the Hepatic duct, and seeing this He
found no communications in their course
downward to the Duodenum, for they live

993.
like parallel without joining, & open separately
into the Duodenum. But then We overlooked a
material communication; If you blow Cystic
Duct, the air does not enter the Pancreatic; But upon
blowing up either the Cystic, or Pancreatic Ducts,
you discover the communication, and you are
more clearly convinced, that the Bile is derived
from the Liver, than you can be from the
Human subject. Lastly, We remarked, and indeed
instances have been found where the Gall
Bladder was considerably distended, and a
stone was found to stick in the neck of it. Now
if that stone had been absolutely impacted, the
argument would have been much more
conclusive, tho it might have dropped, while
it was distended, and perhaps the Patient's
Death

994. Death was hastened by this very circumstance
taking place in a broken constitution. And I
would affirm that we have few instances
of the stoppage of the biliary duct, and where the
gall bladder was found empty, and one
instance of this kind is decisive, for in this
case the gall bladder should have been
distended immoderately, and I have tried
the biliary duct, and after some days I have
found the gall bladder rather increased²
than diminished in size. (Converse) The
bile then passes from the liver to the gall
bladder, and next it passes in the very
known manner, down the hepatic duct, and
up the biliary, for there are no duct passages
from the liver into the gall bladder, for on

on squeezing the Liver not a drop comes ^{995.}
out, and on blowing air into the Hepatic duct
we can distend the Gall bladder, and in the
case of stones stopping the Cystic duct, or on
tying it the Bile does not distend it, Therefore
the most common opinion is just, that the
Bile descends thro the Hepatic duct, & finding
greater resistance to its passage into the
Duodenum than upwards thro the Cystic
duct, it runs up till the Gall bladder is full,
and again, when it is distended, the Bile runs
into the Duodenum, and passes to & fro in the
same canal. Now is there any thing so
singular in this as Allumet would suggest,
For the opinion that the Lumen in a circular way
passes down the Chas Bilearis, then returning
from

296. from the Uterus Animalis by the same
Canal to the Uthra.

Ad us next attend to some of the affections of
this Viscus. First, it is by no means infrequently
the seat of Inflamⁿ and the Symptoms of this are
so well laid down in the common systems, that I
think it unnecessary to say any thing about it.
Likewise without Inflamⁿ taking place to a remark-
=able Degree, this subject to Schirrus, which may come
on in the most insensible manner. Making Expt^s
on different Animals I find, that a violent irritⁿ
will be the foundation of a Schirrus state of this
Organ, in a very short time, in the space of a Week;
In that time I have found a number of white
Knots of a considerable hardness on its surface.
Instead of degenerating into Schirrus, or Suppuration
may take place, & send the matter into the
vein, more or less, into the Cavity of the intestines,
because

because it either corrodes the Branches of the P^{an}
Nepatic Duct & runs thro' it, and so the Gall bladder
has been filled with Pus: or what frequently
happens the Inflamed part contracts an adhesion
with the Mem^o & G^{en}al, with the Mesent^{ry}, or the
A^{nt} of the Colon, and the matter eroding y^e coats
of the Gut finds a ready passage. In some few cases
the Abscess then bursts into the Cavity of the Peritoneum,
when it falls down by its Weight to the end of the
B^{re}stern, and eroding its coats is discharged by stool.
Next, We may conceive that the Liver being inflamed
may adhere to the Peritoneum within y^e Abdom^{en}
Muscle, so that by Poultices, or by making an
Incision, without opening the Cavity of the
Abdomen, the matter may be discharged.
Or if the Abscess forms under the Ribs, & the Liver
adheres to the Diaphragm, and that again
from

99^d from its standing situation adheres to Pleura,
the matter may make its way between the ribs.
Or supposing the Adhesion continued to the
Pleura during the ^{discharge} ^{upward} ^{by} the trachea & arteries,
so I had a case from Dr. Simpson of St. Andrews
where a quantity of pus bile was thrown up
by Cough. In the Ichneumon state of the Liver
its size is sometimes much diminished, Thus we
have an instance in Dr. Haen, where it was
not bigger than the fist, but for the most part it is
enlarged. As when it is in a state of suppuration,
and can be felt at the middle under the
Cartilago enaeiformis, where if the Disease affects
it, in its whole extent, You will distinguish
it more certainly than any where else.
Next, I have shown You large Cysts, and those
containing Hydatides, which are most frequently
found

found in the Liver, tho' by no means confind^{ed}
to that part, for I have seen them in the other
Abdominal Viscera, & even on the outside of
the Peritoneum. Now, what Diseases are the form
of the Nature of these substances? I used long ago
to opine that the common opinion was by
no means to be rashly followed, that they were
Portions of the Cells, the cells being shut by an
Inflammⁿ, for were this the case we would
find two circumstances which are wanting Viz.
a connection with the solids of the Body, and a
Course of bloody pus on them for their nourishment
& growth; but I could not at that time give
any better account of them, as it did not then
occur to me what has been suggested by Dr
Pallies, that they may be animated Bodies
or Worms, which I suspect they are. This Gentleman
thinks

1000. however mistakes the stature of them, and the manner of their growth, He calls the Worm Genia Hydatigena, supposing that a Tape Worm, or one resembling it produces Hydatides: Delatches them from its extremities: He was led into that opinion from the supposition that the Genia produces New Joints. But I see no grounds for that notion, it is incredible, and is not to be received without many Proofs, besides there is nothing like a Genia connected with them; and I find on examining them a vast number of round balls lyed together & adhering to the inner side of the larger Cyst: Now I take these to be the Warrens of the Young, contained within a larger one, and afterwards Delatched from it so one is found within another, but how far this extends is not clear, and I wd suppose that

1601.

That if we were lucky enough to meet with a
Living Animal which labours under them
we might be able to discover motions, for these
are, like the Worms in the Intestines when ye
body cools after Death.

Sect. 74^m

Remains That we consider a Disease more
especially produced by the Liver, or that Male it secretes.

The Jaundice. This term is borrowed from
the French language signifying Yellow, and which
you all know is first, and most distinctly seen
on the White of the Eye, merely because of its pure
white colour, not that the Disease in a particular
manner falls upon that part, for the colour is
universally diffused. Perhaps in some places ye
Yellowness may not only be circulated in
greater quantity, but secreted. I do believe it
will

1002. will be found that the colour is not owing
entirely to the liquor within the Vessels, but in a
great measure to its effusion; and perhaps in the
Eye there may be a secretion into the Cell. so
connecting the Vessels. We find the colour passing
off by the Ducts of the Glands, so that the Saliva
turns Yellow, and even in some cases Bitter.

I have likewise observed that the colour in a
short time tinges the fat and Bones of Animals.
Now, with regard to the fat, I am not altogether
certain whether the colour is in the membranes
which contain it, or in the Oil, but I am sure of
the general fact, that the fat of Animals as of swine
becomes of a Deep yellow. In the Bones, the colour
appears after the Membranes are separated, or
seems to be communicated to them Earth.
Now, so far we may in general make of 4th effects,
must

Next, let us examine, and consider the causes
which may produce it.

It depends generally on a stoppage, perhaps in some
cases upon a too great secretion of the Bile; but
the stoppage of the Excretion certainly produces it.
Now let us see the several ways in which the
stoppage can be occasioned, but more particularly
the causes of the stoppage discoverable by Dissection.
First, You recollect to have seen the Gall Bladder
remarkably distended, and it is so, in
a considerable degree while the animal is in
life, Now we may surely conceive that if the
Bile is thicker & more than usual, part of it
may stop a while in the end of y^e common duct,
where it passes obliquely into the Duodenum;
And we find a number of Physicians agreeing
that Jaundice has appeared in consequence
of a discharge of matter resembling yolks of eggs. Per-

1664. Perhaps there may be something more than this
Yolk the occasion, but nothing was discovered.
We may suppose a Calculus, and that it and the
Bile were discharged together. But there is some
probability that this may happen, only we cannot
perceive that the complaint produced in that way
will be very lasting, for as it has passed thro' the
Cystic, which is smaller than the common duct,
it will be pushed forwards into the cavity of the
Intestines. Now next, the Bile is found to be
indispated, and then conversions form it, of
which I show you here a very great variety, and
you will find every circumstance here, mentioned
by Morgagni, who has given a very accurate
Description of these. There is a vast variety in the
Colour & Consistence, and also in the Disposition
of

of the parts of the Stone. Some are composed of ^{1005.}
concentric lamellae, but the most common appearance
of Bilious Calculi is, that we see as it were rays
springing from a centre; while the Lamellae are not
so evident. The general cause is the same, An
Absorption, as we speak, modified in a particular
manner, & the concretions growing unequally.
We distinguish these from what are called Stones
elsewhere in the body, by their lightness, for they
sink in water, and are of an oily nature,
burning in the Fire. There are two Stones which
were passed by stool, and yet are so very large
that we have a difficulty in concerning how
they could have come thro' the Bilious duct, &
not they resemble the concretions in the Gall
Bladder itself; but they may have lodged for

1006. for sometime, & enlarged in the Intestinal
Canal, and attracted the Biliary parts of its
contents, and thence these may have an appear-
ance very much resembling what they would have
acquired supposing them to have remained in the
Gall bladder.

Now, next it is material to observe to you, that
the same Calculus can produce several Paroxysms
of Jaundice; of which here was lately an example
of a Person who laboured under this Disease for Four
years, and tho' he passed his feces thro' a sieve, he
never found any Calculi; but after Death we
found a large Stone of the size of a common nut,
and of an irregular figure, it was situated about
the end of the Ductus communis, and when in
one situation entirely obstructed the passage,
but in another allowed the Bile to pass; thence

1689.

for several weeks he would have been free of the
Disease, and at other times it would suddenly recur.
Next, we can conceive what Morgagni has dis-
-covered, that if the coats of the Duct are diseased &
thickened, and its capacity in that way diminished,
the flow of Bile into the Duodenum may easily
be obstructed. And in one case of this kind, which
I depicted, not a drop of the Bile could be made
by pressure to enter the Intestine, so that there
had been a contraction, probably in consequence
of some irritation of the Inflammation, where the Duct
passes thro' the substance of the Liver.
Now, next you may conceive the possibility of a
stoppage from the swelling of the neighbouring
Organs, and partly in the Congestions or Sympleses
flands included with the Duct in its capsule.

1008. of Glyson, or if the Pancreas becomes Schirous, the
Bile must flow off freely. Nay the Liver
itself may be swelled, so as to compress very large
Branches of the Hepatic Duct, and on that very
occasion Jaundice. Or whatever humors of Bile
promoting the Diarrhea by the extension
of that Vessel will have the same effect. So I
show'd You one case, which I have no doubt
operated in that way, where above Three thousand
Gooseberry seeds were collected in the cavity of
the Intestines, & evacuated, and I had no doubt
but the great bulk of them in the turn of the
Duodenum, partly by Mechanical pressure
and partly by irritation occasioned the Disease.
Thus arising to these causes (which we suppose
with certainty) to add Spasms of the Duct, prob

brought on from a variety of causes, such as
 Passions of the Mind, or The Bite of Venomous
 Animals? I own I am extremely doubtful
 whether the Jaundice ever proceeds from such
 a cause, & still more whether a permanent
 Jaundice can be produced in that manner.
 With respect to the Bite of Animals; I have
 seen but a few instances of the Bite of y^e common
 Serpent the Adder, which has been quoted as
 a proof of infection producing Jaundice. But the
 Members only in which the bite is inflicted
 swell, and the yellow colour is not from Bile
 But from the tenuity of the blood, nor is it spread
 first in the Eyes. With regard to the Passions
 of the Mind; You will find undoubted examples
 where Jaundice has followed a fit of Rage, but that

1010. This does not prove that the Mass produced a
Spasm. There are many intervening facts
taken for granted, and it is more probable that
the efforts accompanying the spasm may have
pushed down the Bile, or a small Gall into
the Duct; and surely we would be very
doubtful of seeing such cases, when I mention
that in living animals I have repeatedly injected
in various ways the Gall Bladder & Biliary
Duct, without being sensible that they possess
the smallest degree of contractile power, nor
do we find on inspecting them any Muscular
coat, as is very generally described. We find some
fibres, but of a diff. colour, and which are more
irregular than where we know a Muscular
Structure. Add to this a further fact, That

That Calculi lodge in the Gall Bladder, and
passing point thro' the Cydic Duct, frequently
produce very great pain, and yet the irritation is
not attended with Jaundice. Now Now comes it
That Spasms in this case are not excited?

Upon the whole this idea is extremely doubtful,
and Physicians have been led into error
affording a great relief where Opium commonly
suits; But this may be easily accounted for,
As Calculi are perhaps the most frequent cause
of Jaundice, It allays the pain where they
have excited, in consequence of which the
Stones may pass more readily, and the Vit a
tergo will be sufficient to drive them on.

The contractions of the Duodenum may indeed
be so affected as to shut the Duct, but I cannot

1612. conceive that this contraction should be
very lasting. Now, so far we have only found
that Scum does proceed from a stoppage, or
from those causes which prevent the Discharge
of the Bile; that there is one further manner
in which I suspect it to be occasioned viz.
From a more than common Discharge of the
Bile into the Duct, and Alimentary Canal; and
that from thence it is taken back again in
greater quantity than usual. I never find
Children labouring under the Yellow Gum,
whether tho' it is not always from the Bile
yet is sometimes so, and in both cases the
Feces are very deeply tinged. Now, generally the
Child labours under a Diarrhoea, so that
there is a greater flow than common of the

1019.

the Bile, and a greater return of it into the
Mass of Blood. In like manner in the Yellow
Fever of the West Indies, I have been assured
that the Bile was vomited & purged, during
the yellowness in very great quantity. This
fever in a part manner seems to affect the Liver,
and to promote the discharge of the Bile, and in
consequence of this the yellowness happens when
the ducts are widely open. Now, perhaps
if fevers of other kinds sometimes produce
such an appearance, we are not to have
recourse to Opium, but to consider it as depen-
-ending upon a greater flux of the liquor
Nisi, we are led to consider whether y^e yellow-
-ness produced by the stoppage of y^e discharge
of the Bile, owing to the want of motion of

1614. of it in the Liver, or if the Bile is separated
and after that taken back again. You will find
that Montague was of the former opinion, tho
it has been Doubled or Denied. In his Optimum
He says "Piribus biliosis obstructis, liquor Potanum
biliosis transit in cavaum" That is undigested
Different from the idea of a mere stoppage of
excretion, and the liquor being taken from the
Excretory ducts back into the blood. But you'll
find another Author of still greater weight
as constantly appealing to experiment, At
Morganani avowedly, defending this idea, that
the Jaundice proceeds from the want of this
secretion. I do not know what any means
have been devised to bring this to the test
of experiment, tho I apprehend it is possible.
And

and find the probable opinion is, that the ^{1614.}
Bile is first prepared, & secreted, and then taken
back again. That the blood before it passes thro'
the Liver does not contain Bile, yet there is
not a mere separation of parts in the Liver
but an actual change. The food we take in
is converted by the first operation of Circulation
into red blood, which part contributes the most
We do not know, but perhaps the lungs chiefly
and that for many reasons, But we find the
food changed by a gent motion into red blood,
How cannot we conceive that some part
of an may change the red blood into Bile,
and as there is no reason to suppose that any
organ does this immediately but the Liver. i.e.
The Blood in this Viscus undergoes such a
change

1016. change as makes it into Bile. We can show
this in other ~~cases~~ ^{animals}, where it can be extirpated.
Thus there is a very great difference between the
effect of the Liver, when it is prevented from being
discharged, and where the Litter is extirpated.
So we are led to make the same supposition
with respect to the Bile. It should follow therefore
that supposing the Liver not capable of
separating the Bile, a Jaundice would not
follow; a disease affecting the Body in a very
particular manner would be produced, but
without the deep yellow colour. And to confirm
this idea, we find the Liver in a sound state
without Jaundice. We indeed find it sound
with Jaundice, and this perhaps has led to
Morgan's opinion; but in that case it

it operates two ways, By pressure on the Ducts,
 as well as by diminishing the secretion. Now there
 are cases where the whole mass of the Liver
 was shrunken, and at the same time the Bile
 was found in the Gall bladder very thin, and
 almost Watery, and yet there was no Jaundice.
 So I would doubt whether the mere difficulty
 of secretion would cause the disease. I have
 thought of one way further of bringing that matter
 to an absolute certainty, But the experiment is
 attended with many difficulties, and I have not
 yet fully satisfied myself about. The general idea
 is this, I shall endeavour a proof That the Bile
 is returned to the Blood by the Lymphatic System.
 Now this being taken for granted for a moment
 We would next try to prevent Jaundice by
 tying the Thoracic duct, and the Mesary, and if

1018. if we could do this in a single instance, and
Jaundice did not follow, it would prove that y^e
Disease could not be owing to the want of Surden,
and the contrary turning out would not altogether
confirm this idea, as it is difficult to stop totally
the course of the Lymphs. From the lues matine
and numerous comments which Mr. Thorace
did that with the blood vessels, Now in one or two
experiments of this kind, there was no Jaundice
produced, tho' the Bilious ducts were considerably
obstructed with Bile. Upon the whole I apprehend
that the most probable opinion is, that in Jaundice,
the Bile has been prepared and separated by
the Liver, & after that returned from the Bilious
ducts into the Mass of blood; and the only copy
remaining is to determine the manner of its
Return. Now that Jaundice beyond all doubt is

in a certain degree. The universal opinion is
That the Bile is pushed from the Duod back to the
Vena Cava, by the Vena Cava hepatica. This notion
You will observe was Naturaly and Mercurially
introduced before Anatomists conceived That the
Lymphatic was the Absorbent system, and did not
apprehend That the Biliary ducts could have
any other communication with the Circulatory
System. But are we still to retain this idea?
By no means. They suppose That it is carried
to the Vena Cava by initial int veins, or branches
of the Red Veins, and Dr Haller not only mentions
this general opinion of the Bile returning through
such vessels, but gives what is called a Proof
of it, That on fixing an injecting tube into
the Hepatic duct, a colour'd liquor is found to
enter the Vena Cava. Now, I have tried this
exp't

1620. experiment frequently, and I find, that if I use a
very close injection and push it with great
violence, especially if the part is tender, I find
masses of Wax in the Vena Cava, showing that
a laceration had taken place; and I likewise
find without that, that colour'd liquor gets
into the Vena Cava but with considerable difficulty,
and never without observing that it had likewise
got into the Vena Cava Portuum. And in other
cases it had got into the Vena Portuum, and
not into the Cava; so that it goes back by the
branches of the Vena Portuum that send
to the Pile, and from thence fill the Vena Cava
by the connection with the Vena Portuum has freely
with it every where.

Now, take the Disease itself, or consider what
follows from such an Idea; The Pile is pushed back

Back by force, then we are supposed to inject ^{1624.}
the Mouths of Inhalant Vessels. Why do we not
show the Minute vessels filled from the particular
Quett; for all tho I had no view where the Lymphatic
vessels were filled, I never supposed the Mercury
had got into the very mouth of the Lymphatic vessel,
the small vessels were torn & the Injection entered
at holes in their side. Now does not this inject not
force the mouths of Inhalant Veins, & then receive
this explanation. Now, are we able to establish
the existence of all sorts of red Veins in any part
of the body, or are we to make the Liver an
exception? After I had found a Jaundice by having
the Bilious Quett, in about 40 Cases, tho the com-
-mon Quett (which is not larger than a quill)
was enlarged to the size of a Thumb, I did not
once but never injure the Liver; Nay where

1022. where the animal is labouring under Jaundice
I cannot by pressing the Bile within the Duct
push it back into the Mass of blood, for the Gall
Bladder bursts before the parts beyond it yield. The
Glandular parts of the Liver were enlarged, but the
communications with the first Mass were not
enlarged. Lastly I found that inflammations such
injections into the Hepatic Duct, are more readily
felt the Lymphatic vessels, than by a canula.
So I once saw that I injected the mouth of
Lymphatic vessels in the Liver, which is not
to be conceived, the gross injections answering
better than the fine. But I can trace a very
short route to the Lymphatic Vessels, and with it of Bile, for
cutting the Hepatic Duct, & not the Lymphatics
of the Liver, in a few days they were remarkably
enlarged, and filled with Bile, and there
could

could be no mistake by the parts passing thro
pores, for after making the experiments on living
animals we opened them, and I could distinguish
by the Dark Colour, the Bile flowing in great quantity
into the Sympathetic. So thro these the Bile is returned
to the Mass of blood, and I suppose it is returned
in that way only, but of this I am not yet
absolutely sure. The Arguments to the contrary
however, do not merit attention. Throwing part
of the body has ended by itself, and why may
it not be taken back again? Every fluid in our
Body is reabsorbed, May the solids be changed
even the Bones grow lighter by use, and the
Gland called Thymus is almost totally ob-
-literated, Now is that done but by absorption?
and is it enough to say that the Bile is
thicker in the Gall Bladder, and that the Urine

102^d. Thinner parts only, are absorbed. That is no more than to say That the thinner parts of the most readily taken up, as in the case of the Fat, That which is in a diffused state is first taken up, But by That an & fatigue very, part of the oil can be reassembled, & by should we doubt That the Bile is taken back into the constitution in the same manner?

Lect. 9th

In speaking of the effect of the contact on upon the Biliary duct, I said That Gall does descend from the Bladder into the Duct without producing Jaundice; I do not mean to deny altogether That a Jaundice may happen from a stone in the cystic duct, tho' I have not met with an instance of it; But a stone may allow the Bile to go upwards in the Bladder, and at the same time

time prevent its return, and as the yellow ^{1024.}
colour is commenced by the absorption of the
Lymphatics, which run in great numbers on
the Gall bladder, we may conceive the bile to
be returned thro' them.

It might be worth while to suggest a circumstance
which I have not yet prosecuted fully, that the
bile is a much more active substance than is
commonly supposed. We see it returned by great
mass & circulated in great quantity without
producing immediately any dangerous symptom,
yet I know it has a violent effect upon the whole
system when it is collected in too great quantity
even in the Album of animal. Some animals who
are very tenacious of life, as Frogs, Deer, &c. I have
drawn the bile from the gall bladder of three Frogs, &
poured it into the stomach of a fourth, & prevented the

1025. The Animal soon dies by sevenfold mauls
it will be killed. The effects are more violent if
the application of the Bile be made to Organs wh
it does not naturally touch, as if a small quantity
of it be poured into the cavity of the Abdomen, it kills
in a few hours - Nay, poured into the Cellar
under the Skin, without being universally
diffused, the Animal dies agonized in a few
hours. From an increase therefore of a quantity
of the Bile very dangerous symptoms may arise,
without supposing that in such cases y^e Nature
of it is remarkably changed, as Putrid or y^e like.
Thus in the Yellow fever, & Cholera Morbus, we
are apt to connect a degree of Putrefaction, But if
you can suppose any cause to produce y^e flow
of the Bile, as too great quantity of unripe fruit
the

The increase of the quantities may be ^{1826.} ~~caused~~
of the dangerous symptoms, without any alterⁿ
in the quality.

Having now gentlemen, fully examined the
Chylipoetic organs, we proceed to those of the Urine,
Tracing the Renal Artery &c

Lect. 46th

We next attend to the relations and connections
of the female organs of generation, with the Blood=
= vessels Arteries and Veins.

Lect. 47th

Before we examine the changes which are
produced upon the Female organs of generation
by conception, let us consider a little the parts
already demonstrated beginning with the
Kidney. You have all seen this organ
supplied by very large Arteries, which are
sent

1624. Sent off from the Aorta nearly at Right Angles.

The common rule of Nature is one Artery for each Kidney, but there are many Exceptions; For I have seen Two, Three, and even four Renal Arteries to each Kidney. Whether this last happens to be the case, or whether the single Artery divides into a number of Branches, we find between the Branches very few Anastomosis. For unless a very penetrating injection be thrown in, it does not pass from one part of the Kidney to another; so that we may inject one half of the Kidney without filling the other. We are indebted to Dr. Nichol for this observation. And, following the small Branches we see an appearance wh. Nichol calls Globuli Cerebrarum Humini; but of late it has been

been often told by Mr. Newton that these are ^{1628.}
composed of a number of small Branches united
together. And I had formerly remarked that
Stebolt was mistaken with regard to their
education, for if they are Artemium terminis
and so large, they should be the beginning
of the veins, & should be equally seen when
we inject the veins as arteries, which they are
not, so that the arteries seem to run a great
deal further before they terminate.

The next fact which I observed was, that Mercury
fills the whole tubes of the Kidney, & substitutes
secretion of the urine from the Artery, but I
would avoid describing this course till
I have examined it further.

The veins returning from the Kidneys
follow the arteries very nearly. From the pit-

1029. Situation of the Aorta the left renal vein
is obliged to pass across it, & it almost always
goes on the fore side, where it is less subject to
pressure, but in some cases I have seen it
run behind the Aorta. From this passage
it has been very naturally supposed by
Anatomists, that the left kidney wd be found
often the subject of Disease than the right.
as the left side of the Thorax is supposed to
be more subject to Pleurisy than the other;
from the Vena Azygos passing between the
Aorta & Spine. Now I cannot see, that this
is confirmed with respect to the kidney. But
I have often I that Pleurisy is more frequent
on the left than upon the right side, and
the situation of this vein may be supposed
to contribute to this

Now

Now, after seeing the size of the Mineral
 Arteries, I apprehend You will be more ready
 of adopting an opinion which is still retained
 by some, That the whole of the Urine does
 not come from the Kidneys, but that there are
 pores & passages thro' which it is more gently
 strain'd. They cannot conceive that so great
 a quantity of Urine sh^d be separated from the
 Kidneys in so short a time. But considering
 the Density of intervening Membranes, the
 Distance of the Urine from the Ducts the
 Nature, the varied situation of the Bladder
 of Urine in diff^t Animals, the frequency
 of voids, the water not finding these pores
 into the Bladder, We should set aside
 any notions of that sort, especially if we add

1096. add an experiment made 200 years ago
By Eustachius, Whorles & the Doctors & found
That the Bladder did not fill with Urine. And
if we enter upon the slightest calculation
of the immense flux of blood through the
Kidneys the same thing will appear void.
I am persuaded that supposing a quantity
of blood passing thro' arteries according to
their size, the Kidneys circulate a 16th of
whole mass, And supposing the Heart to
contract 60 times in a minute, and that
only $\frac{1}{3}$ passes from the Left Ventricle into
the Aorta at each stroke, this in the space
of a minute will amount to 600 ounces
and the 16th part of that will pass through
the Kidney, and in an hour more or less
weight will pass thro' it, permitting there_{as}

is a vast quantity of Water to be obtained ^{1632.}

off. Now next let us attend to some of the
Morbid preparations. We find that the Kidneys
Receive considerable Strokes along with its Blood-
=vessels. So we would not with Haller consider
them as organs of little sensibility, for he
has in this affair carried things too far.

If we appear to practice it that very often
happened that stones in the Kidney have
produced violent vomiting, the irritation &
consequent Inflammⁿ perhaps spreading to
parts very near. Now, Patients under that
complaint sometimes feel very great pain.
and if there are cases as those mentioned
by Haller, where stones were formed in the
Kidneys, which produced no complaint
let

1099. Let us attend to such circumstances which
will account for this. The Kidney is not a
Muscular organ so contract upon the Stone,
So if a Person labours under a stone of the
Bladder, he feels an uneasiness while the
coats are separated from the Distension of the
Urine; When the uneasiness is considerable
The Kidney then does not contract around a
small stone, and the Stone may be smooth.
And if, as Haller observes further, the whole
Pelvis be filled with stones, which may have
taken on its shape, and yet for a long time
The Patient had but a slight degree of pain;
This may be explained from the inner Membr
growing thick, callous & insensible, and in
this case the Patient may bear his complaint
tol=

1094
Notably well, but we cannot conclude
That the sensibility of the Kidney is inconsiderable.

If again the Stone descends into the Ureter
the most excruciating torture is produced, even
from a small stone, as it is not only lined with
a sensible membrane but covered with a
Muscular coat.

Now, next as a stone produces Inflammation
in the Kidney, so I suspect the Inflamⁿ, in
whatever manner brought on may dispose
us to Calculus, and I apprehend that it is
chiefly the constitution of the Kidney that
is singular, that by inflamⁿ this is so
changed, that the urine passing thro' it
will coagulate more readily than before.
And many People having Stone can date
it from some natural disorder, as a violent
cold

1035 cold, then a Rheumatic pain about the back;
then may have been in some of these cases
a calculus formed first, then that complaint
produced. But I think that taking all cir-
-cumstances together we may also invert
this order. And, we shall find in the so
of the kidney, grains of calculi produced
which do not begin from the urine passing
in the Pelvis, but higher up in the Duct,
but much more frequently the sediments
of calculi are in the open cavity of the
Pelvis. Then in those subject to Strophetic
complaints very often they are taken out
just as they after some indisposition, as a
Debility or Drinking &c or catching cold,
and the complaint goes off by a discharge of

1036.
of very small sand. So that the Inflammⁿ
produces in the Kidney the disposition to form
calculi: And if you excite Inflammⁿ in one
of the Kidneys, I have no doubt but you
may produce a calculus in that Kidney,
where no overthrusting will be in the other.
So where a person has been seized with an Inflammⁿ
about the Kidney, it would be proper to
treat them with a course of Salubrious Med^s
to wash out the tubulous matter, as a small
particle serves as a Nucleus to form a very
large Stone.

Next, suppose the stone to fall down into the Ureter
it makes various stops, on acct of the contracted
irregular shape of the Ureter. There is one curve
where it enters the Pelvis, and a second where it

1097. it enters the Bladder of Urine in an oblique manner, & there are many instances where a Stone sticking there has been the cause of Death. And an attention to the situation of the extremity of the Ureter may be of real use, because it is possible to devise an operation in Women which may save Life. We can discover a Stone by a finger introduced within the Vagina, and no great inconvenience would follow the cutting on it, We have only to divide the Membrane of the Vagina, then the Ureter, and I do not doubt that the current of Urine would continue into the Bladder, & that it would soon close again. But suppose the Colliculus to remain in the Ureter, the effect is the immense Distension of that substance & of the Pelvis of the Kidney, and at the same time the compression of the glandular part, which loses the power of per-

performing its office, so that ^{the} the stone should 1098.
afterwards descend the complaint may bring on
very dangerous symptoms. If this takes place in
one kidney only, the flow of blood is less thro' the
Dilated Kidney, and the push is greater in the other,
which enlarges in proportion, & separates a greater
quantity of Urine.

Now, suppose that the stone remains impacted
in the kidney itself, have we much encouragement
to perform Nephrectomy? I shew you formerly
the difficulty arising from the thickness of the
capsule. To this we can now add the great size of
the Renal Capsule, and from the shape of y^e Pelvis
the difficulty of disengaging the stone. Some
have been extracted by incision, but a suppuration
had formed, and they had worked their way
into the Cell's, so that it only remained to divide

1039. Divide the Ethereal teguments, Therefore I think
We are not encouraged to perform this operation.
You see the other termination of an Inflammation
a Suppuration is produced; and here the matter
is more readily washed off by the Urine; but this
advantage is pretty much balanced by the
irritation which the Urine gives to the eroded
parts, so that Ulcers heal very difficultly here.
Next, You see the termination of Inflammation
in Schemus, which is sometimes very considerable
here without occasioning a stoppage of the
Urine; and unless there is a pretty general
stoppage in both, We do not see the Symptoms
of retention of Urine in the Mass of Blood, tho'
in some cases We find Dropsy induced from
this cause.

Next, Let us attend to the situation of the
Female

Female organs, and the first thing which 1848.
occurs is, that as the Bladder, the Vagina, Uterus,
and Rectum are all tied together, an Inflamⁿ
or any other disease situated in one of these prim-
=arily, may by consent or Sympathy affect the other
parts. We know the fact, that if an Inflammation
is any way formed, neighbouring organs suffer
more than distant ones. So I have seen the
Hemorrhoids occasion Strangury, or Dysuria.
I have seen the same thing, and in a few cases
where an Inflamⁿ had formed (as appeared after-
=wards from a discharge of Pus by stool) the
Bladder was so much affected, that it was
thought the seat of the Disease. For the same
Reason. You all know that substances which
irritate the Intestine, can be made to have
an effect in stopping, or promoting the flow of

1041. of the Menstrues, more than if the same assistance
was to have the same effect on a distant part.

Next, the Distension of one of these organs necessarily
affects another, so the Gravid Uterus in one
period of pregnancy may make it difficult for a
Woman to retain Urine, but in another it may act
so much on the Uterus as to prevent the Discharge of it.
In like manner Women with Child are very often
costive from the pressure behind, but at the same
time every Pregnant Woman has a degree of quickness
of Pulse, and there is a greater absorption of the
Mineral fluid before Delivery.

Next, Nervis happen here, and the Mesica Uterica
has been the subject of it, and has drawn 4 Uterus
with it, and in the meantime a conception
perhaps has taken place. Or the Uterus like the
Rectum is subject to Protrusion from similar causes,
Nay, an excitation in the Rectum may produce a

a prolapsus Uteri; as a stone in the bladder produces a Prolapsus Ani; and the Ves^a Mennae is drawn down with the Uterus Vagina. I have seen one case of Prolapsus Uteri so complete that the whole Vagina was inverted, and the Os internum Uteri made the bottom of a Tumour which descended six inches between the thighs; and in Ruyoch we have some cases of the same kind. As the bottom of the bladder and Uterus were dragged down with the Uterus, or Surgeon found it impossible to introduce the Catheter, not turning it downwards, but directing it up in the common way. In that case there was a stone in the bladder which by its position might have produced the Prolapsus, or Stones may form in consequence of Prolapsus, from the Urine having more time to deposit, and
in

1643. in that case the bladder was greatly enlarged.

The Intestinum Medium is connected but more slightly, so that in that case the faeces passed with tolerable freedom.

Next, let us examine the advantages to be drawn in performing operations here, or the consequences that attend & erosions. You have seen several instances of an erosion between the bladder & Vagina, where the ureter was dis-
= charged from the Vagina; and other instances where in cancerous cases an erosion took place between the Medium Vagina in consequence of Hemorrhoids, which in Old People are apt to degenerate into cancer. Or cancer may begin originally in the Uterus. In like manner Calculi forming within the bladder of urine have sometimes made their way into the Vagina.

Vagina. Next, with respect to operations
 You remember the way the Prostate is laid
 over these Vesicles, so that the High operation for
 the Stone can be done from the good structure
 of part as readily in Women as in Men, and
 the Bladder corresponding to the size of the Penis
 is actually larger, hence it rises higher above the
 Os Pubis. Next, we have seen the possibility of
 making incisions in several ways, some of them
 more easily, than in Men - We can perform
 the External operation, taking the Crest of the
 Labris for our guide instead of the Crest Penis.
 or We can get into the neck of the Bladder from
 the body of the Vagina, or We can take the Urethra
 for a guide; or in Women we are as far advanced
 as when in Men We are come to the last cut
 in the Urethra, and here there is no Prostate
 gland

1045. & land surrounding it. Suppose next, the
Uterus to be retained in the bladder, & we want
to draw it off by a puncture, I have given reason
to reject the puncture above the P. Pubis, and
for entering the Procar nearly where lat-operation
is done in Men. But there is another way
here, we can make our puncture from the
Vagina where the parts are thin, & no maternal
organ comes in the way. Now, with regard
to the Uterus, it is evident that of a Child is to
be extracted by an incision, the operation is
formidable, because we must go first into the
cavity of the Abdomen. In like manner if one
of the Cornua of the Uterus is enlarged, we can
not puncture it with safety, till the Uterus
shall have grown to the side of the Abdomen,
and if there is Water within the cavity of the
Uterus (which has been alledged) there is the
same

same danger, and we would avoid it, May 10th 46.
entering our instrument thro' the Cervix.

If a disease affects the Uterus, & a fistula is
produced, we would avoid the fore part, when it is
connected to the Vagina, as a wound or incision
there will not heal very easily.

Lect. 78th

The Gravid Uterus demonstrated.

Lect. 79th

We shall next attempt to trace the changes which are
produced by Conception

First, Beyond all Doubt the Rudiment, or somewhat
necessary for the formation of the foetus proceeds from
the Ovarium. This appears from the Analogy of the
organ to the Eggs of fowls; You have seen a cluster
of Yolks sticking to the back of a Hen, which are carried
down by oviducts (like the Ovarium in the Human
Female) into the Uterus. Next, it appears from
the

1047. The change there is constantly made by con-
= version in a particular part of the varicum, a corpus
subicum as it has been call'd, from its having been
offen'd in the larger Animals, it is constantly to be
found, and their number corresponds to that of the
Proctus. In the Multiferous Animals We see four or
more according to the Number in the Urine. Next;
there are a few examples where Proctus has been
found in the varicum, and Urine Tube. And
lastly, cutting out the varicum in a Quadruped, has
the same effect as castrating the Testes in the Male.
So far then We speak with certainty, tho' in a gen-
eral way, for several curious points still remain
to be clearly determin'd, for example, we do not al-
= together know whether the consequent change is first
made in the varicum, and after this change, that the
Urine Tube seeks the place as it were, or whether
the Urine Tube first keeps hold by its fimbriae, and
Must=

1048.
Muscular power, & after that a somewhat perfect
upward & perhaps thro' the tube, or some change in
consequence of the hold is produced. The latter is by
much the most probable opinion, that the tube
by its opening turns round & grasps the varicum.
That such a motion is in reality made is beyond
all question, however thin that substance may
appear, and tho' in Birds it is so transparent that
we do not discover Muscular fibres, yet it is a true
muscle, & fixes itself on the varicum in that way.
Next, the thin Membrane, the continuation of the
Peritonaeum which covers the varicum, by swelling
at the place where we find the Corpus Subseum,
is burst, & there is a somewhat comes from the
varicum into the tube, but as to the exact
nature & appearance of that, we are still very
much in the dark. In some animals there is

1069. is reason to believe that the whole Foetus comes out of the Uterum; but if we are to Judge merely from the Observations yet made on Men and Beasts We do not know whether the name of Uterum is proper; whether a substance like an egg contained in a Capsule or Membrane be taken from the Uterum, or a liquor only; far less whether that substance contains a lodgement for the Foetus, or the Foetus itself. So the rudiment is derived from the Uterum, and is conveyed by the uterine tube into the cavity of the Bladder, in which it naturally receives its further growth.

Next let us turn our attention to the structure of the Foetus — I need not repeat the Differences which are to be observed in many of the Organs, except the pointing out the Lungs. Because by examining these after Birth, You can tell whether the Child has breathed or Not. If the Lungs sink You are

1660.

are sure I have not breath'd, nor left more than
ordinary care has been taken to get out the air.
But supposing that they live, you are not
rashly to infer that the child has breath'd Mother's,
because the air by accident, or Design may have
been blown into the lungs, or a certain degree of
Putrefaction may have this effect; for putrefying
the lungs in a certain way the air is generated
& they swim, but every putrefaction will not
have this effect.

But I think we need only at present confine our
views to the Circulation, in order to enable us
to explain the connection between the Mother
& Child. We have found vessels different from
what you knew before, serving two general
purposes. First, ^{the} the connection of the Child with
the Mother we find two Umbilical Arteries, and
a corresponding Vein, and the only difficulty in

1055. in accounting for the appearance of these
canals is with respect to the Canalis Venosus.

Why does the Umbilical vein go into the Porta, and
not directly into the Cava, and Why is y^e Canalis
Venosus smaller than the Umbilical Vein, and
to correspond altogether with both Umb^l Arteries?
These are points not yet fully understood, and it
is needless to tire you with conjectures respecting
them. Next, we find passages for carrying y^e blood
from the Right side of the Heart to the Left, in order
that the whole mass may not be pushed into
the lungs in their collapsed state. Now for this
purpose you would think one passage might
have been sufficient, and enquire, Why we
not only find a Foramen ovale, but a Canalis
Arteriosus? We can readily explain this; Let
us make the supposition that there but one
passage =

passage only, call it Foramen ovale. The consequence is, That suppose this to transmit any proportion, as $\frac{1}{3}$, then $\frac{2}{3}$ remain to enter the Right Ventricle, while the whole mass was passing thro' the Left, and the Ventricles thus would transmit unequal quantities. If again the Foramen ovale was wanting & only a Canalis arteriosus, the Right would have received the whole, and the Left None; Whereas supposing the Foramen ovale, & Canalis arteriosus to transmit equal quantities, then the same proportion passes in the same time thro' both 4^{th} Ventricles, the use of which is evident, as they are intended to transmit the same quantity immediately after Birth.

After birth these passages are immediately or very soon after obliterated, nor can we explain this fully — The Umbilical Arteries are from
the

1052. The very circumstance of the Placenta being tore
away & exposed to the air stopp'd, and the blood clots
in the Placenta, and in the common way of many of
the Human Foetus, the very shutting the short
necessarily shuts both the Umbilical Arteries and
Vein. But what do Authors tell us of the shutting
the Canalis Venosus? That after the Birth the
force is increased in the Vena Cava, but not equally
so in the Vena Portarum. Or why does not y^e blood
run out of the Cava into the Porta? Or answer
Dr Waller to say for its being shut from y^e Diaphragm
being in motion? This may have some effect,
But one cause I know from fact is to be added,
That there is a disposition of the very extremities
of that canal to shut, they shut whilst the
middle remains open, and that is implanted in
the very Nature, in a manner we shall now see

be able to explain, but it is independent of 1054.
any external cause. The passages of the Heart are
altered from circumstances which are more evident.
The Respiration makes a prodigious change there,
The force of the blood, its Velocity and Rapidity are
certainly greater in the lungs, than any where
else in the body; for the the Right Ventricle is
warmer than the left, yet its force is spent
in a much smaller field. Next, the left Ventricle
which is made stronger than the Right is now
collected to act, from the greater flow thro' the
Lungs, with more force; and its action serves
the office of a Valve by squeezing its Membrane
against the Membrane of the Foramen ovale.
Next, the Canalis Arteriosus enters the Aorta
in a slanting direction, so that when the
force of the blood after respiration is increased
in

1055. in the Ducta, the passage is left free from the
tight Umbilical Membrane; and the blood does
not easily pass the contrary way from the
Obliquity of the connection, to which we must
add the Disposition of Nature to contract the
orifice. So far then we understand of the
Circulation of the Fetus.

Next, let us observe its situation & Membranes.
We find it swimming in Water, for the first
day the Amnios is filled with a watery fluid
in which there is a very small proportion of
the coagulable part of the blood, so that it is
not materially different from Water. The
Fetus is suspended in this fluid by the
umbilical chord, and that is fixed to its body
not directly at the middle of the Weight, nor at
the centre of gravity of the fetus; the use of this
is, that its head might constantly be turned down

Downwards, That is the common situation, for ^{1056.}
the cord from which the chord comes is sent out
the top of the uterus. Next, we perceive the
advantages of liquor surrounding the Fetus,
both to It and to the Mother. The pressure on the
Child's body is perfectly equal, so that it is
properly extended in all Dimensions, and It
can change its situation by an effort which is
no doubt attended with advantage. And with
respect to the Mother we find two circumstances.
First, The pressure of the Mother's body is likewise
equal, and there is left chance in any situation
of stopping by pressing, vessels which are material
for the connection between Mother and Fetus.
On the outside of the uterus, and very loosely
connected to it, by a jelly, mixed with Membrane
resembling it, which is called Chorion. On

1037. On the outside of the Chorion we find at first
on the whole surface a flammous substance
surrounding it in an uniform manner, or nearly
so, but there is no Placenta, We do not find any
particular cake in the first Months. Now, How
are we to examine this? There are no doubt
difficulties, but I apprehend We may go a very
considerable way, and Most let us turn our
attention to the vessels of the Mother, & trace them,
& then consider how the communication be made.
You have seen that the Uterus & Appendices
of it are supplied by four chief Arteries viz. The
Two Uterines, and Uterine Hypogastrics. The
first latter rise at a considerable distance
from the Uterus, tho' with regard to that organ
there is little change of place; there is some
useful purpose then served by their length. When

When we trace them, we find a number of 1038
Branches more immediately from the Spermatice vessels
running upon the Ovarium, which are tem-
=perable from the suspension turns they make.
Now, as we shall afterwards find that the Quam
lary of male animals makes a vast number
of such turns, seemingly unnecessarily, we must
imagine that the turns prepare the blood for
performing its purpose of making a secretion
of somewhat material in the formation of
the Fetus. We next observe the Spermatice &
and Uterine arteries joined together by very large
Anastomosis, & these are repeated not only
in the same but in opposite sides, and
further the Branches making the Anastomosis
are suspended in their whole course, and
as much so in the Gravid Uterus, when fully

1089. fully extended, as before or at the time of
conception. Tracing these still farther, we find
that they perforate the thickness of the uterus;
and before conception we can prove beyond
all doubt, that they terminate within its
cavity, and have mouths capable to trans-
mit red blood. You would judge it to be so
not only from seeing the inner Membrane of
the uterus injured, but You conclude so with
still greater certainty from the Gravid uterus
where we find a number of redness humors
there. Why then is supposed that the Menstrual
Blood is Venous? There is surely no room
for such a supposition, and were this y^e case
We must suppose that the order of circulation
is inverted. In like manner the flexor Albug
is a flux from the very same vessels, but in

in a more contracted state; and comes chiefly ^{1060.}
from the uterus, especially when it induces a
Pangor & Debility, there is a relaxation of the
Mucous organs likewise is not improbable.

Next, these are convoluted, for the blood undergoing
changes, for the turns like vessels are not
needed for the mere purpose of a discharge, so
they serve to fit the blood for conveying nourishment
to the child.

Next, most We observe that the filamentous coat
on the outside of the chorion is covered by a
Membrane connected to the uterus, and which
afterwards in a great measure, tho' not entirely,
forms what Authors have called the Spongy
Chorion. You see the connection of that
membrane with the Cervix in these figures
going round, which I have shown for these

1061. Now fifteen years, tho' Dr. Hunter speaks of
this as of quite a new matter, calling this
Spongy Chorion by the name of Decidua, and
representing it as connected and organized.

The name is proper, because there is a real
separation, & it is new, but the thing itself is by
no means so, except that by a more accurate
attention to the formation of it, We have treated
it with greater than former accuracy. Now, y^e
idea I understand of that is, that the uterus as
having vessels open on its inner surface, sends
out these vessels further to make y^e connexion
with the child. This is chiefly done about the
fundus of the uterus, where the vessels are
naturally the longest, and where we find
the blood most readily poured out. The same
thing happens, as on inflicting an wound, or

or where two living substances are brought
 to approach, both send out vessels which make a
 connection. And the only difficulty is to account
 for the more difficult separation in the Testis
 than in the last month. I thought formerly
 that when the Membrane of, which begins
 to elongate, a vast number of branches ran out,
 which afterward the Testis appears more
 easily; but rather the fact, that from the
 Whens there is a something added to the
 surface of the Cranium, and making analogy
 to assist us, we can in some measure account
 for the Production of the Placenta.

You see here the Placenta of a Cow, which is
 very like to the Human one in its Structure,
 but the inner side of the Whens is very soft
 and has a number of glands upon it, and

1063. and we see these long before conception; in
a Lamb they are most distinct, the number
in the cow is about seventy. Now, examine
the ovum of these animals, at first they resemble
an egg, being filamentous, but after that, you
find in Man seventy Placentae. You surely can
not conceive that the ovum could have had
Placentae originally, without being humbling about
fixed on the glandules; but you would conclude
that the glandules of the uterus formed these little
Placentae. In like manner the Human uterus
from the filamentous part of the chorion, forms
the Placenta, & gives & sustains the fundus uteri
done so, as being the most vascular; and in
the case of twins, the Placentae are contiguous
the uterus disposing the filamentous part
to become Placentae, whilst it makes a real

Real addition of a Vascular Structure. 1064.

The Cord comes out from the edge of the Placenta, it is difficult to say how that happens, but the use of it is evident, that the Placenta is in this way more easily detached than from its middle.

Next, let us try to trace the connection between the Mother & Foetus, or determine the kind of it.

Before Anatomy was accurately prosecuted, it was taken for granted that the vessels of the Child and Mother communicated freely, & nourished the Foetus. And some retaining the old opinion tho' without new experiments, still continue to suppose so, but by far the greater number of the late Anatomists suppose that there is no communication by Vessels, but that the Foetus is nourished merely by Absorption, the place where this Absorption is made however is

1065. is variously talk'd of. Most Authors conceive
That the Vessels of the Uterus humiliate at its inner
side, and that the Vessels of the Foetus sucken ye
nourishment from the very surface of the Uterus.
Dr Hunter I observe from Haller's work, and in
the figures of his own tables, tho he gives no
connected history or description of the Uterus, or
use of the parts, so that at present y^e respectation
falls very much to the share of the Artist; But
from the Letter pointed by Haller in his large
Work, it appears that Dr Hunter thinks the
Blood of the Mother is pour'd into the cells of the
Placenta; that there are vast receptacles from
which the Veins carry back the blood into the
Uterus, & that the Foetus sucks up its nourishment
by Absorbents from the blood. Now, I cannot
help thinking that this notion is improbable
& indeed I have a strong suspicion that there
is

is a real circulation between the Mother and ^{1066.}
Child, Mr. Jansky no means able to give a full
& distinct proof of that. But let us examine
a little the principle arguments for the one or
other opinion.

We surely can make no conclusion from our
observing that in Birds, in an egg, the nourishment
must be by absorption; or we would say that
the Nourishment is prepared there first, and
brought to its full perfection; but in the Human
Uterus, there is nothing to prepare, 'nourish',
and there is no such receptacle for it as we wd
conceive to be fit for the purpose, and in short
that opinion makes nothing either way.
Let us rather attend therefore to the Disposition
which resembles us more; but in them indeed
there is one material difference, the gland
of the Uterus secrete very copiously, and act=

1067. actually prepare a liquor, so like in colour
and in Taste to the Milk, that we can readily
suppose both to serve the same purpose. Therefore
there is no direct & distinct Analogy between the
Quadruped & Man, where the glands are wanting.
So supposing that there is no circulation in the
Quadruped, there may be a considerable difference
of structure in the Human body to make up
for the want of glands. There is likewise in
the Quadruped an Amphibian, while there is
no such receptacle in the Human body. What
then becomes of the Urine, is it absorbed by the
Vessels of the Mother? I think the want of
Amphibian rather inclines us to suppose, that
there is such a connection of vessels as conveys
urine readily. Then as there is no example
of nourishment drawn directly from blood,

Is not such an idea highly improbable? It is ¹⁰⁶⁸
not drawn from the surface, for the blood goes
further, in which I agree with Dr Hunter. I affirm
that the vessels pass from the Uterus and enter
the Placenta, May, Albinus was likewise of that
opinion, He says in his Annotaciones Medicae,
"Vasa ad Placentam Pertinent". Now does the
Blood go into Cells? There is no room for such
a supposition. When you feel the Placenta at
an Injection, there is a common extravasation
and a laceration of parts by the force used, and
Dr Hunter saw cells, or the Mass was granulous
because it ran into the common connecting
cells so. The appearance is the same as is
produced when by a violent injection we burst
the vessels of the Spleen, where we can make
the whole mass granulous. Besides I have
ex-

1869. examined Placenta when recently delivered,
None of them are such Natural cells communicating
with vessels which come out of the Placenta, why
do we not find clotted blood in them? Add as the
Vessels run into the Placenta, and are in a state of
change & of growth, why should not the Vessels
join there, as they do from the opposite sides of
an wound? What is to prevent the vessels of
the Mother & Child from forming communications?
As for injections not passing from the Mother
to the child, few Authors have examined that
part with accuracy, & it is very difficult to make
an injection pass thro' so very minute vessels;
as when We attempt to throw an injection
from the carotid Arteries of the Brain into the
corresponding veins. Nay, I find that the
experiment has been made with so little
att=

attention as not to be true, for I have 1070.
ingested the Veins of the Uterus from the Arteries
of the Placenta; I know that this was by means
of an Extravasation, but it shows that a suffi-
cient number of experiments have not been made in
that way, as the fact in point is denied. So
upon the whole I do suspect that there is a
real connexion of Vessels between the Mother
and Foetus, and a real circulation in these
vessels. But whatever opinion you entertain
you may depend upon it that in delivery thou-
sands of Arteries & Veins are lacerated.

The Expulsion of the Foetus is much assisted
by the Muscular power of the Uterus, its Mus-
cular Nature appears from Dissection of the Gravida
Uterus, from its instability, its sudden con-
=traction, and the want of that where the

1071. The Woman dies undelivered, and whilst they
that power the fetus is expelled, the vessels of
the uterus at the same time recover their tone.

Lect 80th

We are now to examine what remains of
the Male organs of Generation.

Lect 81st

We now attempt to connect the two parts
of the Demonstration, & consider the consequences
that may follow from them.

The organ with the only state of the Testicle, which
is then within the body; and I find myself
very much at a loss to assign a cause for this.
It is not to prevent them from being pressed
during Delivery, as they descend into the
Vagina a considerable time before Birth.
Before the Testicle has begun to descend a sac
may be seen, or at least felt, whilst the Testicle

Tendile appears to be at a distance, & loose, 1672.
That by dragging it a little you may push it
into the sac, so that I am not altogether certain
whether this process first descends, & the Tendile
follows it, or whether the Tendile by pushing
down forms the Process; but I would rather be
disposed to the latter opinion, as I suspect that
the Cremaster Muscle is the chief agent in the
Descent, that Muscle is inversed, whilst the
Tendile is within the body, & forms a part of
the chord, which makes the connection to the
ring. Sometime after the Tendile has got down
the process shuts at its upper part in the Human
body, but in other Animals it remains open
during Life; which by the bye shows us that
Man is intended for a different situation; in
the erect posture that process being open would
have

1073. have exposed into Thuris: Now, in the
Eradicated wherefrom. The common situation
of the body, there seems little danger, We find a
fatty substance placed over the top of the sac, which
acts like a Valve, That when they are raised
erect the undisturbed Menstrual may not fall into
the sac. After the Procept is shed, in a few Months
there is not the least vestige of a Cicatrix in the
Peritoneum; But the sac of the Peritoneum and
That of the Vaginal coat seem as distinct as
any two Cysts in the body, and yet the Vaginal
coat is evidently the continuation of the Peritoneum.
Why the upper part of the Procept sheds more
readily than the under, I cannot readily
explain, but an excudation from the Juncea
Albuginea, or body of the Testicle may prevent
the union below. We likewise can readily
see =

explain why air is confined by it. Specimen 4074.
Shew, Yourpience That it is covered over by the
Peritonaeum; That there is really a Vagina which
grows freely to the Spermatheca vessels, and the
conclusion extends so far as the body of the Testicle
then ceases. You likewise from observing this
original structure, can explain what Jones
happens, That the process remains, and a com-
-munication between the Vaginal coat of the
Testicle, and the cavity of the Abdomen, that Water
may pass to & fro, and the Bowels descending
from the Abdomen, may come in contact with
the Testicle. The Spermatheca usually commonly
begins under the Perineal, but there is no such
constant law of Nature in this respect as
Boerhaave pretended. For I have seen it
begin higher than this, and from it, but
seldom much beneath it. Hence the length
of

1675. of its proportion to its size is greater than that
of any Artery in the body; Nor are we to say
with a late Writer, That there is nothing unusual
there, But that the Artery rises high up, because
the Testicle is originally an Abdominal Viscus; But
with the Ancients we are rather to consider that
Artery as owing to prepare the blood for sending
the Semen. Now I shew you the Arterial
Artery of a Man, which is greatly convoluted, &
if drawn out into a single line w^d measure
upwards of Twenty feet. We must therefore
suppose that the blood is barely fitted for the
duration of the Semen. Add to this that of the
situation of the Testicles within the body
were the sole cause of the rise of the Arterial
Artery at such a distance, Nature w^d have
directed some medium, and sent off these
vessels

veins from the Hicca communis, some ^{1076.}
would call these as the Anusels called the
Veins corresponding to them viz. Arterio
Properantes, as the blood seems to suffer some
change in them before it reaches the Testicle.
Next, the Veins are remarkably large in proportion
to the Artery, and this perhaps, besides giving
a more favorable return to the blood, is likewise
of use in the formation of the Semens. When
We compare the Artery winding round the
Branches of the Vein, so entangled that we
cannot but easily understand how Anastom-
= oses came to be supposed between them, but
now We are certain that the Anastomoses
are in no shape singular, and that y^e red
blood enters within the Testicle in considerable
quantity. From the smallness of y^e Artery, and

1077. and the want of the Utricle a large, the Spermatic
Nerve are very subject to Varix, & that sometimes
to such a degree as to give the appearance of
Hydrocele or Hernia. But we distinguish
it from the feel, That of the Hernia is, and
Hydrocele appear smooth & Uniform, whereas
the Varix is like a number of Worms filled wth
an elastic matter. There are further cir-
-cumstances which will render y^e distinction
perfectly clear; The Tumour owing to y^e veins
extends from the body of the Testicle the whole
way up to the ring, in the erect posture it
very much distends, while in y^e Horizontal
the swelling almost wholly disappears. Try
this in yourself, and you will find that
the bulk of the chord is much greater when
you stand than when you lie; Which by the way
shows

Shows the Utility of the horizontal posture
in swellings, Inflammⁿ of the Testes. Men, tho'
Ye may prevent this by a moderate pressure
on the swelling & humifit, whereas in
the Hydrocele & Hernia there is no change by
posture. We endeavour to relieve this complaint
by abstraction to posture, the use of Astruc's pills
and of the Cold Bath.

Next, let us see the blood within the Testicle. The
Spermatic vessels divide into parts which are very
minute, & are spread on the surface or folds of the
Testicle, without our being able to see any knot
or gland by which the secretion of the Semen can
be supposed to be formed. We find nothing but
nude Branches of the Artery spread on the
Tubis of the Testicle, and when we push a
very fine silver injection, We sometimes fill

1079. 24^e cavities of the Testes; I am not certain that
Nerves, or imitated the structure, or that it had
burst some of the Branches & had been extravasated;
tho' the former is more probable, especially as we
can imitate the motion of liquors that are still
thinner than serum.

Next, let us turn our attention to the Seminal tubes,
the structure of which is more various than any
other which has formerly appeared in the Human
body; and which has been so much applied by
the French in particular, in explaining the
structure of the other organs. The whole containing
~~the~~ Membrane of the Testicle is filled equally
& uniformly with tubes, which make up far
the greatest part of the body of the Testicle. From
taking an exact measure of the Diameter of
these tubes (supposing the Testicle entirely
com-

composed of them, when filled with Mercury,
 the length would be fully more than 300 feet;
 Now I deduct near one half for Blood Vessels, &
 it follows that there are Threads within one
 Testicle, which when connected together might
 be extended the length of 300 feet. As we see
 how these are disposed. First, I find Septula
 which have been denied by Albucius, and others,
 who imagine I took the blood vessels, part of the Vessels
 running in were mistaken for Septula. These
 are thin Membranes sent off from the Albuginea
 which make Divisions, but which are not so
 Regular as those of an Orange. Next, in each
 bundle a number of convoluted tubes are
 contained, where we do not easily see either
 beginning or end. At last from the convoluted
 tubes there are straight Vessels sent off which seem

1681. Seem to be single from their beginning, a single
vessel making all the turns; so these Tubes are
every where of an equal size. If therefore we can
determine the number of Vessels which compose ye
body of the Testicle, which I have taken pains to
do, in this manner, I divided the Testicle into
three parts, tried these several ways to make
the Testicle transparent, and I find I can
 reckon about 130 of these Vasacula; & I suppose
we may see about 130, and as no injection
enters with equal readiness into all the ducts,
I shall suppose that I saw but one half of the
real number; and I apprehend we may con-
-ceive that the Testicle consists of about 300
convoluted Tubes: Now as the whole length
of these join'd together exceeds 3000 feet, each
of them must be 10 feet in length, and I have

unscrewed some Threads to the length of some
 feet, & as I broke them before I got to the end, Nor is
 it for practice merely, that we sh^d fix an exact
 number. Next, the Ducts coming out of 4 Testicle
 communicate, or there is a rete testis, the several
 tubes are joined by cross branches, one running into
 the other, in an uncertain & irregular manner.
 Then from that Work, at the upper end of 4 Testicle
 Nephels are sent out again straight, from 12 to 16 or
 18 in number, that varying in depth persons —
Haller calls these (very properly) Vasa Efferentia,
 carrying the Semen out of the Testicle. After they
 travel a little way straight, they become
 convoluted, & form vascular Coils, which form
 the upper end of the Epidymis, and from that wh^{ch}
 is call'd the head of the Epidymis, the rest of
 its body is extended & convoluted. This part the

1089. We can first separate into lobes, then draw it
out into Thread. Now, the point to be determined
is, Where the Lobes separate becomes single; or how
much of the Epithymus is formed by the Vascular
tubes, in what part of its body do these unite?
To determine this, I first injected the Epithymus
with Dutch silver, & then dissected it without
any of the Mercury getting out, by which I was
sure none of the ducts were divided, and I found
that somewhat more than $\frac{1}{3}$ of it is formed by
Vascular Cones, which gradually unite into a
single Tube, the continuation of which forms the
rest of the Epithymus. Or what proved the same
thing, I cut the Epithymus transversely, and
observing in Mercury I find that it runs out
from a single orifice. The Tube at first is
not larger than a bristle, but gradually en-

enlarges somewhat, and every drop of ^{1084.} 9^c
Seminal passes thro' it; the length I knew to be
20 feet; or the Seminal from its first separation
within the Testicle, before it reaches the Vas Deff
passes thro' tubes 30 feet in length, Thence you
must conceive its passage to be very slow, and
that considerable changes take place in it, by
Magnetism & Absorption; and we observe an
uncommon number of lymphatics here —
Now, if a Tumour should form in the part of
the Epididymis next to the Vas Deffrens, & whole
Seminal ducts might be stopp'd by it, and you
may observe that of Genereal tumours forming
here, Genes may make the Prognosis, that unless
it is soon removed, the Epididymis will swell
and then the whole body of the Testicle. We
also observe the cautions which is necessary here ^{is}

1085. in performing operations, as Pydrucle, & for
with the point of a Pin you may as effectually
cast out a Man, as by cutting out the Testicle.
For if the smallest Wound is made, or if the Teste
Burst, it is a great chance if it will heal again:
So I saw a Soldier in the Infirmary, who had a
small hole over the Epididymis, from which
there was a continual Discharge of a liquor wh^{ch}
resembled the Semen, and wh^{ch} it was impossible
to heal. But if humours form in the beginning
of the Epididymis, they are less dangerous, for
if one can be stopp'd, the Semen gets by means
of the Reticles, to others, & so forwards to the
Vas Deferens.

We find near the Epididymis several Cysts
sometimes Wandering in an unfixt manner;
Some come off from the Reticles, & join^g &

The Epididymis later than the rest. From seeing
 a Sympathetic connected with a Vessel of this kind
 I suspected that it might have been of the same
 Nature; or that the Semen running off from that
 vessel went to the Mass of blood thro' a Sympathetic;
 But I have several times seen several Vessels of
 that kind, but no Sympathetic connected; so I
 apprehend that this Vessel being joined with
 Semen, the Menstruum had stopped, and been
 extravasated, then in the common way had
 entered a Sympathetic; and that these Vessels are
 Vascular Cones wandering off. Now the fact
 is of great use, because it explains what may
 happen in Practice, that whole Epididymis
 shall be divided accidentally, yet the Semen
 continue to be secreted, because the whole of
 it may run thro' the tube; and indeed such a

1687. a Quous Nature may sometimes happen.

Now, after showing the course of the Semen, By
what power can We imagine it motion contain'd?
We surely cannot conceive that it is owing to the
mixture of the Cremaster Muscle, or to the
Contraction of the Men of the Sperm, neither
can We add merely the Vis a tergo from the Adheses.
So that I am inclin'd to believe that the Semel
Ducts are purely Muscular organs, that they
possess the Contractile power, & push forward
their contents like the Lymphatics: especially
that I find on good Authority, that from the
Passions of the Mind, Tumour of these parts
have been induced, which must suppose some
inward motion to take place; and y^e Dog
-kind want Muscular Seminals, hence their
copulation is tedious, and in time of it a re-

1688.
Remarkable quantity of blood and Semen
are carried from the Testicle. The pressure of the
Cremaster Muscle may push on what is contained
in the testes, but there seems to be somewhat
more than this. At length the Vas Deferens begins
to assume the structure of the Vasculum Seminale
which are an intestine. Cecum with a
number of Intestina Cecae connected. This first seems
to increase the surface, which is the same as
increasing the length of the tubes, that the necessary
changes may continue to be made. Next, that
from the number of hairs, the whole Semen
may not be thrown out at once, & the chance
of conception be thereby greater. Now by what
power are the Vasculum Seminale supplied?
Imagine We may again produce contraction
of

1609. of their proper coat, for if the whole Seminal
tubes have a motion, the probability is still
greater, that the motion is inherent in y^e Vessels.
But certainly we ought to add the purpose of y^e
Muscles behind them, particularly of the Devator
Ani which squeezes the Vessels Seminales
against the bladder. Then we find the Semen
mixed with the liquor of the Prostate gland, y^e
use of which is by no means very evident.
Almost all I can say is, that the purpose is
secondary, and that the Rudiment of the
Hooker is chiefly driven from the Testicle, for
in Birds its structure is nearly the same as in
Man, but the Prostate gland is wanting.
Along the Middle of the Muscles duct with their
orifices directed towards the end of the Penis
as

as I explain I before.

1090.

Lastly, let us attend to the structure of the
Penis & the manner of its erection. The general
circumstances of the structure are sufficiently
understood; there is an elastic rod of great strength
which covers the cavernous part of the Penis
itself, which serves to give sufficient firmness to it,
and the Sphincter Dividing Membrane to prevent
the over distension; it is composed of Tendinous
fibres, & is imperfect, so plainly made for
strength; a large tube being more easily burst
than two small ones containing the same
quantity. Then we find the Cavernous rod of
the Urethra at the bottom forming a Bulb, continued
cylindrical of the membrane of the Urethra,
and again enlarged to form the Glans. Now
the purpose of what can be explained; We have

1696. have seen the Muscles placed on the coats of 4^e
Corpora cavernosa & into the cells of both that of
the Bulbosa & Penis. The blood is diffused in the
erection, so a pressure is made on the Root, and
the blood is pushed forward to the extremity;
and this is partly necessary in the Glans. That
about the time the Semen is to be thrown out, the
glans may be fully distended, then more readily
to excite these motions in the female organs,
particularly in the Fallopian tubes, which are
necessary, that the Vitelline tube may be turned
to the Ovarium. We have only to see how the
Corpora cavernosa are filled, and afterwards
emptied. As to the latter, by the Elasticity of its
Membrane, the blood is pushed back into the
Veins, by Mechanical force, and there is
no

no Absorption. The great Difficulty is to ^{1007.} ~~act~~
for its Effusion; Now this Difficulty is lessened by
attending to the appearance of the Veins, & their
course. Dr. Whipple accounts for it on the supposition
of an increased Dilation of the Arteries; but
this is insufficient, and they stop the Veins by
Dilatation, only prepare for occasional emergence
of the cells; Now we must attend to a circumstance
which can hinder the Return of the blood in the
Veins, or render it difficult, and we observe
that the coats in the Venous spaces thus are
thicker & of a redder colour than those of the
Arteries. So that it may cause a muscular
power, and by its contraction may stop the
blood. Now, it divides into two Places, the
largest of which settles deep within the

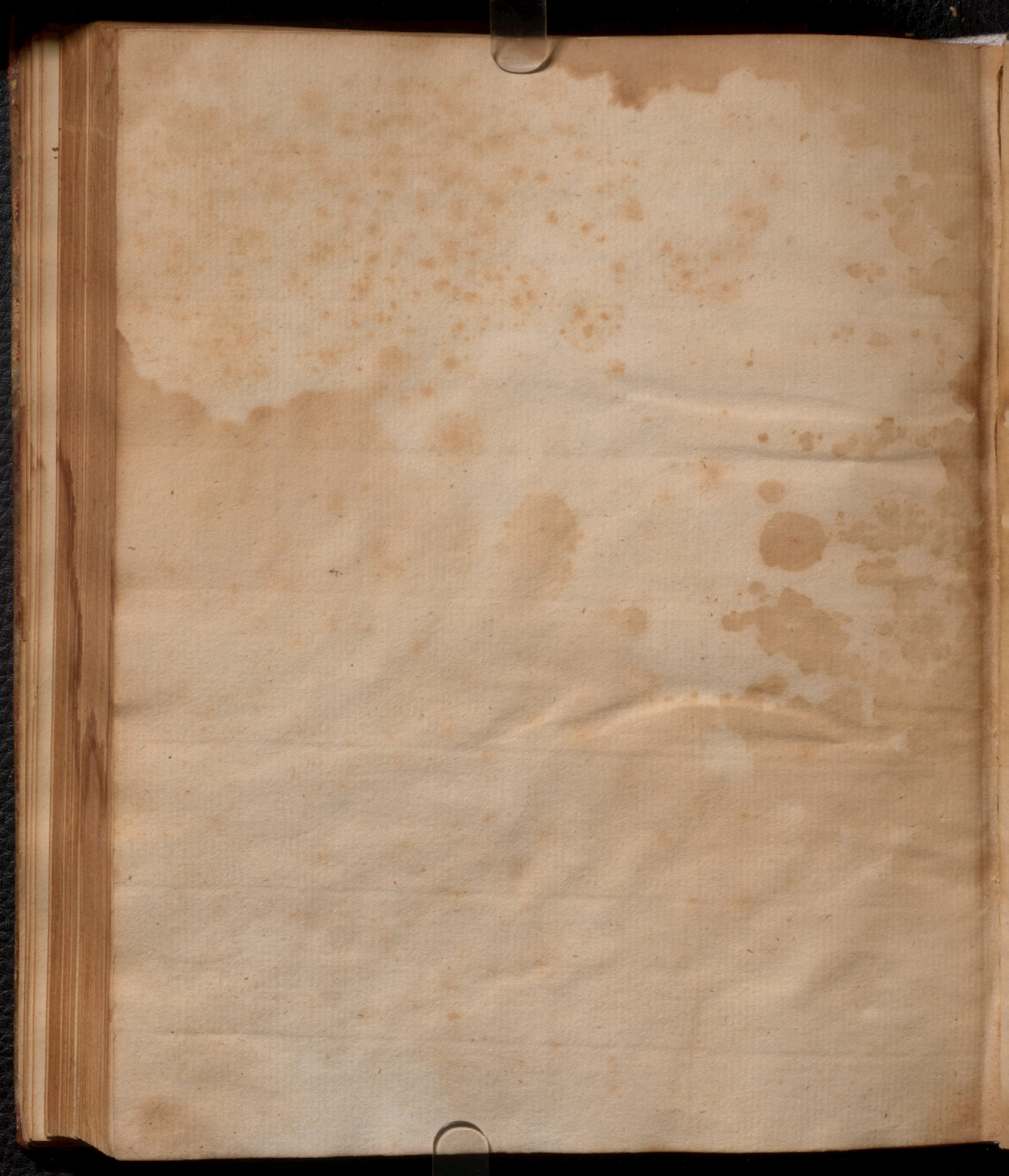
1093. The Levator Ani; which muscle therefore has a
considerable effect in stopping the return. As we
find that the distension of the Bladder during
has a mechanical effect in this way, and tends
very much to occasion an erection, the Levator
Ani is Muscled round the Pelvis on both sides
so as to prevent the blood from returning
with its usual freedom —

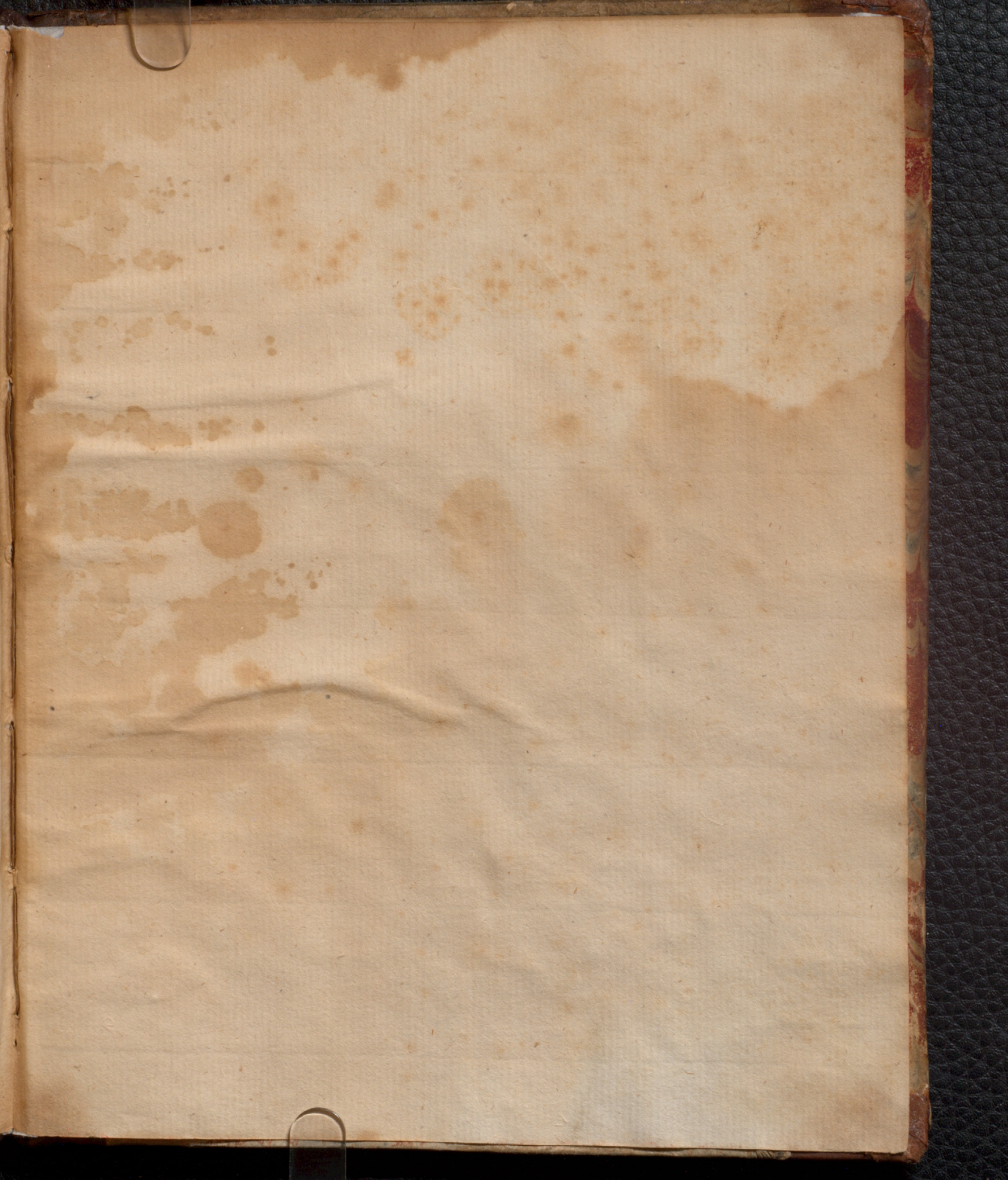
End of Volume 4th

De Jure

22^o Oct 1790







MS.
Acc. no. 346
v. 4

1575308878

